THE
JOURNAL OF MENTAL SCIENCE
[*Published by Authority of the Royal Medico-Psychological Association.*]

No. 413 [NEW SERIES No. 377.] OCTOBER, 1952. VOL. XCVIII

Part I.—Original Articles.

THE LATAH REACTION: ITS PATHODYNAMICS AND NOSOLOGICAL POSITION.

P. M. YAP, M.A., M.B.Camb., M.R.C.S., D.P.M.Lond.
Medical Officer in Charge, Mental Hospital, Hong Kong, and Lecturer in Mental Diseases, University of Hong Kong.

[Received 20 March, 1952.]

PAGE
I. Introduction 515
II. The Literature on Latah. The Early Period. The Modern Period . . 516
III. The Jumpers 519
IV. Miryachit 521
V. Imu 523
VI. Disorders Related to, or Confused with Latah. Convulsive Tics. " Primitive Hysteria." " Sleep Intoxication." " Startle Neurosis." . . . 524
VII. The Evolution of the Concept of Hysteria. Present Connotation of the Term 528
VIII. The Concept of Fright or Shock Neurosis 531
IX. Cases Observed in Malaya 533
X. Pathodynamics 537
The fright stimulus and proneness to fear. Adaptation to fear; the startle effect and processes of central inhibition. Echo-reactions and automatic obedience, and their relation to identification, fascination and hypnosis. A theory concerning the basis of command automatism (or automatic obedience) and the echo-reactions, with special reference to the latah reaction. Coprolalia. The psychology of tickling. Ageing, habituation, and hysterical gain.
XI. Latah and the Malay Ethos 550
Aetiological considerations. Ego-development and its cultural background. Latah and the norm in behaviour.
XII. Nosology 556
XIII. Latah and Comparative Psychiatry 560
XIV. Summary 561
XV. Bibliography 562

I. INTRODUCTION.

FEW mental diseases have attracted the attention of medical men working in outlandish parts of the world more than Latah. This is due, not only to its intrinsic interest, showing as it regularly does the unusual symptoms of echolalia, echopraxia, and automatic obedience, but also to its remarkable geographical distribution. This illness was described by travellers to the Malay Archipelago in the latter part of the nineteenth century, but very similar reactions were later found to exist in other lands, known to the native peoples by other names. The term " Latah," however, is the best known, and as the common features between these various reactions became apparent, it has been used as an inclusive name for them all. It is to-day employed with much the same connotation in the French, Dutch, Italian, and English literature, but the discussion of its nature betrays inadequate understanding, attempts at its nosological classification remain unsatisfactory, and speculations as to its aetology continue to be somewhat fanciful.

The reason for the unevenness of the contributions to the study of this reaction lies doubtless in its occurrence remote from centres of modern civilization. It is only within the last decade or two that it has received the (rather scant) attention of trained psychiatrists, in contrast to ethnologists and doctors with anthropological interests ; but the psychiatrist is, as a rule, unschooled in the concepts and methods of the anthropologist, and sometimes becomes the victim of common prejudices when he studies psychological phenomena in ethnic groups far removed from his own.

Apart from "latah," the reaction is known by a motley of names. Those of purely ethnic interest are : *Miryachit* (Hammond), *Amürakh* (Czaplicka), *Meriatschenje* (Tokarski), *Olonism* (Shirokogoroff), *Ikota* (Schrenck), *Imu, Imubacco, Toconibacco, Young-dah-hte* (Manson), *Bah-tschi* (Scheube), *Yuan* (Bastian), and *Mali-mali* (Musgrave, Sison). These are all local names used in different parts of Siberia, Hokkaido and S.E. Asia, while in other parts of the world where the reaction is found, e.g., on the southern fringes of the Sahara, there is no local term for it. Other names by which the reaction has been described are : *Schreckaffekt* (Moreira), *Echomatism, Mimicismus* (Castellani), and *Arctic Hysteria* (Hammond), all of which have psycho-pathological or psycho-dynamic connotations. In addition, this subject has in the past been linked with *Convulsive Tics* (de la Tourette), to which latah is quite unrelated ; and also with *Jumping* (Beard), with which latah is definitely identical, as we shall show.

The term *lâtah* conveys to the Malays a curious behavioural quirk, or aberration, normal, and yet not quite so. Its derivation is obscure. O'Brien (1883*a*) remarks that the Malay use of the term is wide ; he mentions Clifford's suggestion (1897) that it means "ticklish," a suggestion very meaningful, as we shall see, for our understanding of the psychopathology of the reaction ; and he himself suggests that it is derived from *melata*, meaning "to creep," adding slyly, but not without psychological insight into the nature of the illness, that the derivation would commend itself "chiefly to those classes of English-speaking ladies who connect nervousness with 'the creeps'." Gimlette and Thomson (1939) in their *Dictionary of Malay Medicine* say that metaphorically *latah* means "love-madness" ; this points to the sexual connotation with which the term is coloured. The use of it to describe an anomaly of behaviour probably dates from the early years of Islamic expansion into Malaysia in the fourteenth or fifteenth century, as evidenced by old Malay manuscripts.

II. The Literature on Latah.

Previous contributions to this subject may be divided into two periods : (*a*) The period up to the second decade of the present century, characterized by descriptions of the reaction as found in different parts of the world, and efforts to bring these together into a common syndrome, with only feeble attempts to explain its underlying basis. (*b*) The modern period, when more serious attempts were made to arrive at a psychopathological understanding of the illness.

(a) *The Early Period.*

The earliest mention of latah in Malay literature is in an old manuscript, the *Hikayat Koris*, wherein a queen is described as "falling into a fit of *latah*, and behaving like a lunatic, not knowing what she was doing" (Gimlette and Thomson, 1939). An early description of it was by Logan (1849), who communicated it to the *J. of the Indian Archipelago* in Calcutta.

In 1880 Beard first drew attention to the "Jumping Frenchmen" in Maine in an address to the American Neurological Association. The following year, Gilles de la Tourette, who, while studying under Charcot, had been formulating his syndrome of "Convulsive Tics," translated Beard's communication into French (Tourette, 1881). O'Brien (1883*a*, *b*), working in Malaya, wrote on latah to a local journal, declaring it to be a "common but mysterious" malady ; not being a medical man he refused to speculate on its nature, but nevertheless his papers are of scientific value, and remain among the best on the subject. Hammond (1884), a New York neurologist, first drew attention to *Miryachit*, basing his account on the reports of three U.S. Naval officers who had travelled from Korea across Siberia to Europe. With great perspicacity he compared it to "somnolentia," "sleep-drunkenness" and "*schlaftrunkenheit*." He was aware of Beard's report, and thought that *miryachit* was " identical " with " jumping," though he curiously maintained that the former required an example as a stimulus, and the latter only an order.

From this point Tourette (1884) took up the subject again, and boldly (but mistakenly) insisted on the identity of his syndrome of convulsive tics with *miryachit*, " jumping," as well as latah (which last disease he mentioned in his paper of 1885 to have been described in the *London Medical Record* of 15 August, 1878). While reporting that several such cases were known to both Charcot and himself, he refused to offer an interpretation of this " bizarre state," and stressed the need for further observation and for approaching it without preconceived ideas. Neale in the same year also claimed that *miryachit* was indentical with latah. The following year Tourette gave a full description of convulsive tics (" *une affection nerveuse caractérisèe par de l'incoordination motrice, accompagnée d'écholalie et de coprolalie* "), and again stressed its relationship to latah, etc. In 1897 Ellis brought into relationship with latah not only " jumping " and *miryachit*, but also the *bah-tschi* of the Siamese, first described in the German ethnological literature by Bastian (1867). Osler (1894) mentioned both latah and *miryachit*, and thought they were " choreiform " in nature.

About this time interest began to fade in these various types of what I propose to call the latah reaction, with the exception of the latah of Malaysia itself. This was probably due to the accessibility of that area, and the fact that at that time European colonization of Malaya and Indonesia was at its most vigorous. Latah was so common in Malay lands that it claimed the pen of several lay writers. An account by a naturalist, Forbes (1885) was probably exaggerated, as, e.g., when he described a woman suddenly frightened by a snake vibrating her finger in imitation of its tongue until she was struck dead ; or another crawling on all fours in imitation of a lizard which had startled her. Clifford (1897) and Swettenham (1900), both pro-consuls of great literary ability, gave accurate and sober accounts, which are of note because of their authors' intimate knowledge of the Malay racial character and cultural *milieu*.

The steady increase of interest in latah as a psychiatric syndrome by itself may be dated from a paper by Van Brero (1895), the first report from what is now Indonesia. He gave it the astounding name of " Provoked Imitative and Impulsive Myospasm " (*Provocirte imitatorische impulsive Myospasie*), and regarded it simply as a hereditary cerebral neurosis. Ellis (1897) offered the interesting suggestion that there were two forms of latah, mimetic and paroxysmal, the latter related to amok. Gimlette (1897) emphasized that latah differed from the " lata " or " *délire à Java*," previously noted by Bordier in his *Gèographie Mèdicale* by being non-epidemic. This reference to an epidemic latah-like disease invites comparison with the hysterical epidemics of medieval Europe (*). Gimlette also compared to latah the conditions of *ramenajana* in Madagascar (*vide* Andrianjafy, 1902), *tara* in Siberia, and *tigretier* in Abbysinia, but it is extremely doubtful whether these are as definitive and clear-cut a reaction as latah is, and they should probably not be classed with it. In this, however, he has been followed by other writers, e.g., Manson (1912).

The practice of collecting descriptions of the reaction from various parts of the world and grouping them together was by now common. Scheube (1903) gave an account of latah in a chapter on organic illnesses (along with sprue and dysentery). He followed van Brero generally, and also mentioned at the same time what he regarded as allied diseases : the *mali-mali* of the Philippine Islands (? ref.), *bah-tschi* of Siam (quoting Rasch), and *yuan* of Burma (quoting Bastian, 1867). He further mentioned that Högström (? ref.) has seen it among the Laplanders. He thought that they were all " based on suggestion.† "

By 1902 the use of " latah " to describe the reaction outside Malaysia had become accepted, and Gilmore (1902) reported it as such in S. African Kaffirs. The illness was sufficiently well-known for Milne-Bramwell in his classic book on hypnotism (1903) to take notice of it, and he asserted therein that latah was definitely not hypnotism as others had suggested, e.g., Gimlette (1897), who regarded it as self-hypnosis. Gerrard (1904) described a case in whom type-dreams of white people riding winged horses occurred after every attack, and whose attacks could be stopped and prevented by hypnotic suggestion. Fletcher (1908) thought that the severest cases were in a state similar to that of somnambulism or the third stage of hypnotism.

---

* Cp. also the report of epidemic latah in a religious brotherhood by Porot (quoted by Repond, 1940*a*) and of epidemic *miryachit* in a troop of Cossacks (quoted by Czaplicka, 1914, p. 313).

† Other German contributions were by Scheben (1900) and Revez (1911), but further German interest in latah ceased with the frustration of their colonial ambitions. *Vide* also Moreira (1924).

In 1910 Musgrave and Sison reported on *mali-mali* or the latah reaction of the Philippines, ascribing the disease, in the fashion of those times, to " degeneracy " ; they also remarked on the fact that it was an affection of the lower classes and suggested, adopting a psycho-dynamic point of view, that the educated instead would tic when placed under similar psychopathological conditions.

As late as 1912 Manson was discussing latah in relation to various epidemic hysterical phenomena, and even compared it to " possession." He was probably the first to write a formal account of it as a purely psychogenic disease, emphasizing the factors of suggestibility, imitation, habituation and a craving for sympathy ; he thought it was characteristically a disease of " barbarous and semi-civilized countries," although the weak-minded of more advanced nations were not immune. Omerod (1912) regarded latah much in the same light as Manson, but called it a form of epidemic hysteria. Although neither of these two authors had made first-hand studies of latah, their interpretations were in the light of the psychiatric knowledge of those times, not unplausible. The same could not be said, however, of the views of Abraham (1912) who said that latah in its " paroxysmal form " (*vide* Ellis, 1897) was identical with amok ; or of Ballard (1912) who thought that latah was a minor hysterical fit, as *amok* was a major one.

Latah was now so well known that Allbutt and Rolleston's *System of Medicine* (1912) devoted a whole chapter by Manson to it. Castellani and Chalmers' *Manual of Tropical Medicine* (1919) similarly had a chapter on it, but they merely quoted from other sources, and betrayed a complete innocence of psychiatry (as could be seen from their adoption of sub-headings like " Delusions " and " Autosuggestion "). Fitzgerald (1923) presented a formal treatise on latah and amok which contained nothing original, but repeated the out-of-date notion of van Brero's that it was a cerebral neurosis.

(b) *The Modern Period.*

The modern period of the study of latah may be considered to date from Galloway's effort (1923) to analyse the psychopathology of the disease. Although only a general practitioner, and not a psychiatrist, he ascribed the reaction to shock and delayed inhibition, hypnotic-like suggestion, and what might be termed culturally determined fear ; and he also attempted a psychopathological classification of different degrees of the reaction. Van Loon, who held the Chair of Psychiatry in Batavia, was probably the first psychiatric specialist to give full attention to the disease. In 1927, after an earlier paper in Dutch, he wrote on latah, in connection with amok, in English. In terms familiar to us, he described latah as an elementary and monotonous type of hysteria arising from fear in peoples with a relatively simple ego-organization ; but he had a sterile belief in innate racial psychological traits and called latah " a psychosis of the Malay races, rooted in the oriental psyche." He was, however, keenly interested in the comparative psychology of peoples and in 1928, influenced by Head's ideas, published some observations on " protopathic-instinctive phenomena " in Malay behaviour with special reference to latah (and amok). His generalizations were somewhat forced ; his notions were basically those of Kretschmer's concerning the " primitive reactions," but were boldly applied to racial psychology, employing the terminology which Head had evolved for describing certain aspects of sensory physiology. Van Loon's observations and ideas were summarized in the French literature by Codet (1927), who called latah simply " an exotic psychoneurosis."

A few years later a series of papers by Italian writers appeared. Sarnelli (1934) described latah in the Yemen, Penso (1934) in Italian Somaliland, and Natoli (1937) around Benghazi, in Cyrenaica.

The most satisfactory studies in recent years have been by van Wulftten-Palthe (1936), and by Repond (1940*a*, *b*). The former, who was Professor of Psychiatry in Batavia, prefaced his account of latah with some very sound comments on the principles which should guide the student of comparative psychiatry, and has given the most adequate nosological analysis to date of the reaction. He denied that it was a psychosis, still less was it hysteria, but it was a hysteriform reaction, largely an artificial product of the environment, with hyper-impressionability to fright playing an important part, but he failed to give an interpretation of the very characteristic echo-symptoms and hyper-suggestibility seen in the reaction. Repond observed his cases in the S. Sahara (but called it an "oriental psychosis"), and concluded that it was neither hysteria, anxiety neurosis, nor "obsessional anxiety" as had been suggested by Perussel but a neurosis peculiar to primitive peoples whose mentality was too rudimentary for them to be able to build up a psychic structure comparable to the psychoneuroses of more developed peoples. He placed great emphasis on the "suggestibility" of the natives, and made interesting observations on the necessity of "rapport" between patient and examiner, but attempted to explain neither the nature of the symptomatology nor the relation of the reaction to fear; and, like many French-speaking psychiatrists, he failed to pursue effectively the dynamic point of view.

If we turn to other recent writers, the very unsatisfactory understanding of the reaction is painfully evident. Fletcher (1938), contributing on this subject to the *British Encyclopedia of Medical Practice*, was clearly unused to psychiatric terminology when he said that latah was "akin to a kind of hysteria called 'suggestion-neurosis'." It is a matter of regret that the standard text-books are very feeble and out-of-date in their treatment of the subject, and keep on repeating opinions of no value. Kinnier Wilson (1940) stated that the "hypnosis-like condition" lasted until suggestion was removed, which is not true; he repeated the myth that it had affinities with convulsive tics; and furthermore he called *miryachit* in a very banal manner a "collective psycho-neurosis." Strong (1944) could say no more than that it was "a peculiar form or manifestation of hyper-impressionability." Christian (1944) in *Osler's Principles and Practice of Medicine* likened latah as well as "jumping" to Bamberger's "saltatory spasm," which he supposed to be related in some way to impulsive tic or Gilles de la Tourette's disease—an impulsive tic being "a psychosis allied to hysteria and psychical tic, though in some respects it has the features of a monomania" (p. 28). Nothing could be less helpful or more confusing. It was not until 1946 (the 7th edition) that Price's *Text-book* ceased to term latah, after Scheube, a "cerebral neurosis" (a suggestion first offered by van Brero nearly sixty years ago), and to express the regret that no *post mortem* examination had been recorded. Manson-Bahr (1950) still regarded it as a "hypnotic-like trance" in some way related to the supposed fact that the Malays were highly strung. His account of it revealed an understanding of the subject which went little beyond that of Manson when the latter wrote on it in 1912.

III. THE JUMPERS.

Although almost as soon as "jumping" had been described by Beard (1880), Tourette identified it with latah (1884), and the connection between the two was repeated parrot-fashion from one author to another, there was little real understanding of their mutual relationship. The result was that the vague resemblance of latah to the "jumping" of N. America was mentioned on the one hand, and, on the other, it was naïvely suggested that the Mongolian racial constitution as well as extremes of climate were causative factors in latah. It is necessary clearly to examine and to re-affirm this relationship between latah and "jumping."

The "Jumpers" or "Shakers" were a group of religious folk, originating from the Methodist Congregation of Wales during the time of the evangelist Whitefield. They called themselves the "United Society of Believers in Christ's Second Appearing." Their religious devotions involved ritualistic jumping, shaking, and also the utterance of incoherent gutterals (hence the name of "Barkers" by which they are also known). These unusual ceremonial antics were looked upon as exercises to supplicate divine favour, but they eventually led to the repudiation of the whole group by the English Methodists, and their leader, a Manchester woman called Ann Lee was tried by the Church of England for blasphemy. (It was said that she rebutted the charge in seventy-two different languages, some of which had not been heard of before or since.) In 1774, under her leadership, the group migrated to America, where like so many other earnest sects they founded several colonies on the Eastern sea-board. About this time, there were wide-spread hysterical epidemics in the south-west of England (Hirsch, 1886, p. 525).

The peculiar social organization of these colonies was highly conducive to the appearance of collective hysteria. Men and women lived together in one building, but strict separation of the sexes were enjoined, and each sex lived on a separate floor, cooking and eating apart. Their ministry included women, but this was because those who took part in confessionals had to have ministers of the same sex. They were communistic, revolting against the institution of the monogamous family, and at the same time they had to be celibate. On this account married people joining them had to live separately. Conditions like these are naturally frustrating to the sexual needs of men and women. They were as stern as they were industrious, and enjoined for themselves strict rules of discipline which even told them which foot to put first on the ground when they got up in the morning. According to Holloway (1951) there are still about a hundred of this sect in the present day.

The origin of their characteristic mannerisms during worship may never be fully known; but the term "Holy Rollers" sometimes used to describe them serves to indicate that their ceremonial behaviour might not have been strictly defined and standardized, and might originally only have been a manifestation of excessive religious fervour, energized and heightened by instinctual drives that were denied their direct expression. The institutionalization of such behaviour would almost be inevitable in a group struggling to maintain its precepts, beliefs and its whole identity in a new country; such behaviour would with the greatest of ease develop into ceremonials which would serve effectively as an expression and a symbol of group cohesion.

If the "jumping," etc., developed into accepted ceremonials, it cannot therefore be separated from the hysterical. Charcot and Richer have remarked on their resemblance to the symptoms of some of their cases of "*grande hystérie*." Religious excitement provides just the right psychological condition for the mass appearance of crude hysterical symptoms, and the preaching of fiery and none too elegant Methodist evangelists caused these curious and extravagant mannerisms to spread far and wide in the United States between 1798 and 1805. At the "revivals" or camp-fire evangelistic meetings of this period thousands of men and women would jump or roll about together in religious ecstasy, sometimes at a single word of command. Yandell (1881) has given a striking account of these mass hysterical phenomena. The jerkers would jerk violently and all together, sometimes in a most alarming fashion; the rollers would roll or run until they were exhausted, and often mere laughter might bring on the attack; the barkers would move about on all fours, growling and snapping their teeth, and barking in exact imitation of a dog. Often 3,000 people would fall on to the ground as one.

Those who practised these exercises commonly became a prey to them, and they might find themselves laughing incongruously during a sermon; or a woman might suddenly jerk and fall from her horse, and then start to roll, while giving an account of her religious devotions. Even cynics were reported to have been affected by example. Only the slightest stimulus was needed to produce these effects, even at quite ordinary times. Beard (1880) reported that it was only necessary to point a finger at some of them to start them rolling. He was the first to study these phenomena from the medical point of view, and it is only necessary to read his description of the Jumpers he met to be convinced of the complete identity of "jumping" with latah. Because of the significance of this relationship in establishing the aetiology of latah, and the neglect of it by so many writers, I shall quote Beard's original contribution *in extenso*. His subjects were a little colony of people of Caucasian stock (not half-French as commonly repeated) living by Moosehead Lake.

"One of the Jumpers while setting in his chair with a knife in his hand was told to throw it, and he threw it quickly, so that it stuck in a beam opposite*; at the same time he repeated the order to throw it, with a cry or utterance of alarm resembling that of hysteria or epilepsy. He also threw away his pipe when filling it with tobacco when he was slapped upon the shoulder. Two Jumpers standing near each other were told to strike, and they struck each other very forcibly. One Jumper when standing by a window, was suddenly commanded by a person standing on the other side of the window to jump, and he jumped straight up half a foot from the floor repeating the order. When the commands were uttered in a quick loud voice the Jumper repeats the order. When told to strike he strikes. . . ."

When Beard tested their powers of repetition with quotations from Virgil's *Aeneid* and *Homer's Iliad*, he managed to make them repeat the text in a quick sharp voice, while at the same time they kept on jumping, striking and twisting their shoulders.

---

* Cp. the case described by Shirokogoroff (1935, p. 248) when a knife suddenly fell before a Birarcen, and he at once seized it and plunged it into his child; and again Ellis' case where a Malay-Portuguese woman, at a sudden noise, would shout out an obscenity and throw anything handy at the nearest person (Ellis, 1897).

" It was not necessary that the sounds should come from a human being. Any sudden or unexpected noise . . . would cause these Jumpers to exhibit some one or all of these phenomena. One of these Jumpers came very near cutting his throat while shaving on hearing a door slam. They had been known to jump into the fire and into water ; they could not help striking their best friend, if near them when ordered. . . . It was dangerous to startle them in any way when they had an axe or knife in hand. All the Jumpers agree that it tires them to be jumped and they dread it, but they were constantly annoyed by their companions."

Beard mentioned that the disease was " epidemic," but restricted mostly to the north of New Hampshire, Maine and the adjoining part of Canada. He was aware that " cases had been reported among the Malays upon the other side of the globe." The disease affected even children of 4 or 5 (as in latah), but quite unlike latah it was rare among women. This is a unique feature of " jumping." He found 15 cases in only 4 families, which suggested a familial distribution. Those affected were quiet and retiring by nature, deficient in power of self-assertion or push. He thought it was a temporary trance induced by reflex imitation and fear. In a sense, he reflected, we were all Jumpers since many of us, if caught in a fire, would go into a trance and show convulsive movements. Moreover, it was probably an " evolution of tickling," adding as a curiously naïve after-thought, " the habit of tickling each other in the woods." We shall later have occasion to discuss the importance of tickling in producing the latah reaction.

IV. MIRYACHIT.

The first mention of *miryachit* was by Hammond in 1884, and in introducing it into medical literature he compared it to " jumping " as well as to " *Schlaftrunkenheit* " (which Bleuler (1936, p. 116) regards as a kind of hypnagogic intoxication arising from a sudden wakening, and generating a dream which leads to motility before the dream passes off). La Tourette (1884) and also Neale (1884) were the first to relate it to the latah of the Malays.

Although Hammond's account was based only on the reports of a trio of U.S. Naval officers in Siberia, yet he seemed to have grasped the essential nature of the illness. The case described is that of a ship-steward, middle-aged, intelligent and physically normal, who, against his will, was mercilessly teased by his colleagues, and rendered echolalic and echopraxic. When the captain clapped his hands, and when he made as if to fall, the victim had to follow suit. He eventually managed to hide himself in his cabin, but even then had perforce to imitate the shouts and grunts of his tormentors outside.

Hammond asserted that *miryachit* differed from " jumping " only in that the former required an actual example and not simply an order for the echo-reactions to be elicited, but later writers have observed automatic obedience in *miryachit*. There is no doubt that features of latah such as the echoing can be experimentally produced on rude awakening from sleep, and his invocation of a hypnoid condition to explain the basis of the reaction enables us to identify the common underlying basis of the several quasi-normal reactions known by different names which have been associated with latah.

Hirsch (1886) quoted the ethnologist Schrenck (1850) on the *ikota* of the Samoyedes, an illness undoubtedly the same as *miryachit*, which Hammond recorded as being commonly found in the Irkutsk region. Schrenck distinguished a mild form which consisted in the utterance of inarticulate sounds when teased or when something repugnant is seen ; and a severe form in which the patient may become violent and aggressive. It was found almost always among women, especially married ones. The so-called " severe form " is not clearly delineated, and it is not clear that Schrenck and Hirsch distinguished *ikota* from the undifferentiated " hysterical " outbursts of primitive peoples. The " screaming women of Samara" observed by Acke as well as the " screaming possessed women " studied by Guttceit in the people of Orel and Kursk, both quoted by Hirsch, are almost certainly examples of " primitive" hysteriform phenomena unrelated to the latah reaction.

For later studies on *miryachit* we must turn to Bagenoff (1911), Czaplicka (1914), Novakovsky (1924), Shirokogoroff (1935). The works of Czaplicka and Shirokogoroff deserve special attention, being detailed ethnological reports. According to the former, *miryachit* was first described by the traveller Steller in 1774. It was known by many local names, e.g., *amurakh* among the Yakuts, *olan* among the Tungus, *irkunii* among the Yukaghirs, *menkeiti* among the Koryaks, and *imu* among the Ainus. In practice, the term " arctic hysteria' ' has been used loosely to cover *miryachit* as well as other vague nervous disorders and religio-magical phenomena which are themselves essentially hysterical in nature. Czaplicka thought that most cases of *miryachit* were cases of hysteria, although it was clearly not hysteria as seen in Europe. It was always regarded as a disease (unlike the latah of the Malays), and even a Shaman, if he should become affected, would be ostracized and made to give up his position of authority.

Shirokogoroff used the terms " olonism " and " imitative mania " in describing the latah reaction among the Siberians, and, like Czaplicka, regarded the term " arctic hysteria " as having a rather wider connotation. " Olonism " is derived from the Tungus word meaning " to be suddenly frightened," and has the associated meaning of " doing something stupid and useless because of sudden fear." The term is used to describe only non-violent, imitative behaviour that is not regarded as the result of spirit-possession. " Olonism " only involves a minimal loss of consciousness, if it does occur at all. As soon as the patient recovers from unconsciousness, he may react in one of three ways—attack, retreat, or beg for mercy (the last reaction, as may be expected, is commonly to be seen in females). For continuation of the imitative behaviour a series of stimuli are needed. The symptoms are exhibited in all degrees of intensity, and in the minor degrees it is not held to be abnormal. Cases have been known where discouragement and disapproval have resulted in the arrest of the development of the disease. In order to bring this about the patient is sometimes given a new name, or a case of advanced " olonism " is given another name so that his illness may not bring him harm. This, of course, is a magical way of propitiating unseen powers not unknown in the superstitious practices of other races.

Shirokogoroff noted that among the Tungus " olonism " had a certain social function, as it often provided a spectacle or performance (like Malay latah) " without which Tungus life would be impoverished." The Manchus in the region were settled agriculturists and rather more " civilized " than the Tungus ; they expressed a great disapproval of the symptoms, especially coprolalia in women, and this appeared to have resulted in a much smaller incidence of the disease in Manchu women in contrast with the Tungus.

Shirokogoroff's attempt at explaining the symptoms was essentially a theory based on a rather tortuous application of the conditioned reflex (*op. cit.*, p. 248), and is incomprehensible ; but his studies of the latah reaction among different ethnological groups in Siberia, like that of Czaplicka, are of permanent value. He disagreed with the latter, denying that " olonism " was a kind of hysteriform syndrome, and insisted that it was an illness *per se*. " It is liable to diffusion, fashions and variations, both individual and ethnical, is rooted in the normal psycho-mental complex, and as such it must be separated from the facts gathered under the name of hysteria " (p. 252). The root of the problem in this case as in so many others is the meaning of " hysteria."

It might be well to append some examples of this very important type of the latah reaction. We may take as being quite representative of the mild, abortive reaction the cases mentioned by Shirokogoroff (p. 247) where the word *sirkul* (evil-spirit) if suddenly spoken out in the presence of a susceptible subject will at once produce a brief show of echolalia or coprolalia.

Advanced cases are exemplified by the girl described by Shirokogoroff (p. 248) who, after a fright, kept on imitating the eating movements of another, and stuffed herself so full that at last she had to vomit. Another example is that quoted by Czaplicka (p. 310) from Jochelson, where an old woman had to imitate a mischievous Cossack teasing her and run with a fish between her teeth into a stream, shouting all the while " Enough ! Enough !" Czaplicka also quoted Kashin's account of a regiment of Transbaikal Cossacks who echoed their Colonel's commands, and the more the latter expostulated the more readily were his swears imitated. This is (apart from the example described by Porot (*vide* Repond, 1940*a*) in a Moslem religious group) the only convincing example of what might be called in the exact sense epidemic latah mentioned in the whole literature on the subject, and is clearly of great importance for our understanding of the reaction. Just as " jumping " is related to the epidemic hysterical behaviour of the revivalists, so *miryachit* may under certain psychological conditions (e.g., in groups trained to instant obedience) take on an epidemic form.

V. IMU.

This illness was mentioned in passing by Czaplicka (*op. cit.*), but she was unaware of any serious study on it. Apart from the latah of the Malays, it is the most closely examined of the various examples of the latah reaction, and deserves a section to itself. A first-hand account was furnished Winiarz and Wielawski (1936), but this was based partly on earlier papers by Sakaki (1903, 1906), Uchimura (1935), and Uchimura *et al.* (1938).

The Ainus were the earliest inhabitants of the Japanese islands (with a language showing evidence of an original Sanskrit stem) who were in the course of time driven by the present-day Japanese into the northernmost island of Hokkaido. To a large extent they are still pastoral folk, living by fishing and hunting only and unable to take to agriculture. They have no literature, but only folk-tales for a cultural tradition. Their social organization shows traces of totemism in the past. The social position of women is very low. In religion they are animists, the world for them being peopled by gods and spirits personifying the forces of Nature.

Some figures are available regarding the incidence of *imu* among this people. Winiarz and Wielawski observed 12 cases in three villages with a total population of 1,000 and estimated that there were about 100 in all Hokkaido. Uchimura *et al.* estimated that there were 111 cases among the total of 17,500 Ainus; and they thought that cases of *imu* composed two-thirds of the psychiatric material to be found in this people.

As in the case of latah, old women are mainly affected, and indeed Uchimura found that the overwhelming majority of his cases were female. With the advance of civilization the disease is getting rarer, so that most cases are now confined to old women. The Japanese are hardly ever affected, and if they are, they have invariably been brought up from childhood in Ainu homes. (This is exactly the case with Malay latah when it occurs among the Chinese brought up in Malay surroundings and according to Malay customs.)

The attack is always brought about by some sudden stimulus, be it only a sudden sharp word or a loud interruption during a conversation. Commonly the initial fright springs from the ingrained fear of serpents and similar snake-like creatures, so that the reaction may be exhibited by the sudden sight of caterpillars and the like (or even snails). There is a belief that a certain serpent spirit can expel evil spirits from the body by entering in their place, and in becoming thus possessed, the patient shows the condition of *imu* (*imu* means " possessed "); another version by Sakaki is that serpent-possession is regarded as punishment for wrong-doing, and the superstition is so firmly held that if a person steps on a snake he expects to become, and in fact does become, *imu*. This is an excellent example of the cultural conditioning of an abnormal psychological reaction. Sakaki found that, of the 12 cases he studied, 5 developed the disease after a snake-bite, 2 after seeing a snake, 1 after hearing a noise like that made by a snake, 1 after a nightmare of an attack by a snake, and 1 after a fright by a large caterpillar followed by nightmares over this for several nights; only two failed to give a definite history of trauma due to fright. Uchimura stated his belief that about 60 per cent. of cases follow fright, the remaining cases arising from imitation, but he did not explain why mere imitation should have such a pernicious effect.

The immediate reaction to fear may sometimes only be wild aggressive behaviour, or running away in panic; but certain persons show the typical echoing and automatic obedience, and negativism too, if the fear stimulus is prolonged. Loss of consciousness only occurs if the " fit " is drawn out, and when the patient recovers he usually retains full memory of it and may show considerable embarrassment.

Once a person is subject to *imu*, he never recovers from it. It may become progressively worse, and in such cases the patient becomes solitary and seclusive, with, as Winiarz and Wielawski noted, marked changes in personality such as fearfulness, meticulousness and shyness. This fact is of great importance when a nosological analysis of the reaction is attempted.

Winiarz and Wielawski affirmed that *imu* was identical with " jumping," latah and *miryachit* (but wrongly ascribed the first to the Red Indians, influenced, no doubt, by the popular notion that the reaction sprang from a racial peculiarity associated with the Mongolian division of the human race). They believed that it was " a primitive form of reaction to fear, manifested by impulsive action, by aggression, by flight, or by forms approaching to the cataleptic conditions". This is much too vague and inclusive a definition of the reaction, and while enabling some insight to be gained into its psycho-dynamics, tells us very little about the pathogenesis of the remarkable symptomatology. Their analysis goes no further than to reduce it to " catalepsy," which, in any case Sakaki (*ibid.*) denies as ever occurring in *imu*. Uchimura *et al.* (*ibid.*) pointed out that it was not simply acute fear, but a reaction standardized by habituation. It was not hysteria as we knew it, since it was monotonous, undifferentiated, and almost itself a reflex action. They added the important remark that since other hysterical symptoms were only rarely to be observed, this was Ainu hysteria. *Imu*, like latah, they regarded as a " primitive or ancestral form of hysteria," dating back to the earliest times, and arising in a primitive psychic disposition marked by suggestibility, emotional lability, and superstition.

It is doubtful whether anything is to be gained by saying that any kind of hysteria is " primitive," and the fact of its occurrence among *some* of the " simpler " peoples is certainly not explained by invoking " a primitive psychic disposition " and " superstition."

VI. Disorders Related to, or Confused with Latah: Convulsive Tics: " Primitive Hysteria "; " Sleep Intoxication "; " Startle Neurosis."

The latah reaction has from the very first been unfortunately associated with convulsive tics. This syndrome is still described by contemporary neurologists (e.g., Ascher, 1948) and it is necessary to examine it in some detail to differentiate it clearly from latah. Apart from this, the idea of " primitive hysteria " is frequently encountered in the literature on the latah reaction, and it is clearly of importance for a proper nosological study of latah to enquire into its meaning as well as its import. In this connection it will also be necessary to consider " sleep intoxication " and the so-called " startle neurosis."

Convulsive Tics.

The interest of French neurologists towards the end of the nineteenth century in involuntary movements led them to classify and differentiate the tic-like dyskinesias. Gilles de la Tourette, working with Guinon under the general guidance of Charcot, isolated the syndrome of convulsive tics as a clinical entity in itself, defining it as a nervous affection characterized by motor inco-ordination and accompanied by echolalia and coprolalia, and gave a description of 8 cases (1885). He was particularly interested in the coprolalia (or "*escholalia* ") which occurred together with the tics. Trousseau had previously drawn attention to this association before, but, as Tourette pointed out, his observation had been completely ignored until the reports of Beard and Hammond on " jumping " and *miryachit*. Tourette, of course, had no opportunity to study at first-hand these two illnesses, and it was solely on the basis of these two papers that he boldly synthesized his own *maladie des tics convulsifs* with " jumping," *miryachit* and latah (known to him through O'Brien's account) into a single clinical entity. In doing so he departed from the intelligent psychological speculations of Beard, Hammond and O'Brien; for although he stated that it was premature at that time to offer an explanation for the " bizarre state " that was latah, yet by incorporating the latter into the general class of neurological tics, he could not but contaminate discussions of its nature and aetiology with the sterile idea of " degeneracy " so fashionable in France at that time. However, Tourette's views were repudiated by Tokarski (1890), who insisted that *miryachit* fundamentally differed from convulsive tics in being a psychogenic condition. Meige, Feindel, Guinon and Magnan were all against regarding *convulsive tics* as an entity by itself, although Meige and Feindel held that both the tics as well as the echo-reactions sprang from the same soil, but were otherwise unrelated. (*vide* Meige and Feindel, 1907, p. 226).

There can be no doubt that the latah reaction and convulsive tics are unrelated. As understood nowadays, the latter consists in facial twitching and stereotyped movements of the upper and lower limbs, with compulsive utterances and often obsessional ideas. The movements usually begin in the lower part of the face and spread downwards. The patient opens and shuts his mouth, spits, twists his head, jumps, twirls, and may even dance. The muscles of phonation are frequently involved and they produce with the tic weird, barking noises, or sometimes echolalia or coprolalia. Echolalia, however, may be manifested independently. The movements can be partially inhibited by the will, and cease in sleep or under the stress of emotions. Obsessions, when they occur, may not coincide with tics. Although the patients show no definite symptoms of dementia, they are often unable to concentrate and undergo a personality change in the direction of seclusiveness and nervousness. The symptoms begin between the ages of 7 and 15, and the illness runs a fluctuating but usually progressive course.

The Salpêtrière school attempted to derive echolalia from tics of the muscles of phonation, and echopraxia (or " echokinesia," to follow Charcot) from tics involving the limb muscles. Tourette indeed was so impressed by the association of tics with echolalia and coprolalia that he considered them to be essentially the same thing. This rather bold generalization no doubt arose from the neurologizing trends of that time, and a failure to appreciate the significance of the psychological forces binding the individual to his " behavioural field."

When the echo-reactions and coprolalia are prominent and they are manifested as a result of a sudden and unexpected stimulus, it is possible to see a resemblance of the condition to latah. In the original 8 cases described by Tourette, however, 3 cases showed neither echo-reactions nor coprolalia, and 2 others did not show echolalia. Two of these cases showed the symptoms if they were unexpectedly stimulated. In one case the illness began by conscious imitation of these unusual symptoms in early life. The cases ranged in age from 11 to 26, and only 3 of them female. The two cases which reacted to sudden stimuli might be quoted in detail :

> Case 1 was a girl, aged 20, intelligent, and drawn from the working class. At the age of 16 she first started to show facial tics. Soon she began to remark aimlessly on things around her, with frequent obscene interjections, and she also frequently repeated the last word of her sentences. Her interjections were usually accompanied by odd contortions of her face. There was no echolalia in the true sense of the word, but when excited she sometimes showed echomimia. Whenever she was suddenly called she would jump and repeat her own name.
>
> Case 2 was another girl, aged 21. Her illness started at the age of 8 with tic-like blinking, one year after she had been terrified by a bursting bomb during the siege of Paris. The tics spread and took a fluctuating course. Whenever she was unexpectedly touched she would jump up in fear and tic. She was by nature nervous and excitable. She became much better after a lapse of 7 years. One of her sisters was similarly affected.

These cases resemble latah but are clearly not identical with it, inasmuch as tic-like phenomena, which are essentially spontaneous contractions of muscle groups, are never seen in the former. Echoing and automatic obedience in latah always require some degree of " rapport " or at least of forced attention to a stimulus. There is no reason, of course, why some features of the latah reaction, in particular the " clouding of consciousness " following sudden fright and leading to a certain helplessness and passivity cannot be superimposed on a person of poor personality already suffering from co-ordinated tics. Indeed, the second case above, although she showed no definite echo-phenomena, might well be an abortive case of latah, and the history of the illness dating from a definite psychological trauma is highly significant, as we shall see later when we come to discuss the nosology of latah. The complete syndrome of convulsive tics is very rare, and must have been so even in Tourette's time. He himself mentioned that Broadbent and Hughlings Jackson told him that they had neither of them seen a case in England.

Tourette never committed himself on the pathology of convulsive tics, but his whole approach was of course neurological. Nor could he have escaped from the climate of French neurology at that time and its preoccupation with the doctrine of degeneration. He contributed little to our understanding of the latah reaction, but he was the first to bring this subject, after unifying it from disconnected accounts drawn from widely separated areas of the world to the attention of those in the fore-front of neuro-psychiatric development at that time.

" *Primitive Hysteria.*"

The term " hysteria " has been given different meanings from ancient times, and is even to-day interpreted in various ways. The evolution of the concept of hysteria is of fundamental importance for any discussion of the nosology of the latah reaction, and this we shall deal with in the next section. We may consider now the large range of quasi-normal psychological phenomena that have been described among various outlandish peoples under the name " hysterical " or " hysteriform," especially the primitive " short-circuit " reactions to overwhelming stress; or abnormally exaggerated affective reactions described by Kretschmer as the " primitive reactions " (*vide* p. 51).

Behaviour which may be called the " primitive hysterical outburst " has been reported in many of the " simpler " peoples. Among the natives of Nyasaland, when a person is crossed or frustrated, he may sometimes brood and remain morose for a long time ; if he is further teased, he may suddenly run away into the forest, throw himself blindly at others, or in a rather histrionic manner jump into the water. This type of behaviour is known as *misala* (although it appears that this is a generic name for all sorts of vague mental disorders) and has been the subject of a paper by Howard (1910).

The same kind of reaction is found among adolescent girls in the Congo region, and is known as *banga*. Unable to stand frustration, fear or sorrow, they rush about, crying aloud, and may show speech disturbances and even convulsions (Castellani and Chalmers, 1919).

Brill (1913) has described very similar behaviour among the Eskimos, which he calls " *piblokto* or hysteria." Certain women, rebuffed by husbands or lovers and thereby suffering a loss of love, may brood for a time, with their eyes reddened, their pulse raised, and perhaps showing a long-continued tremor of their limbs. Then suddenly they may scream, gesticulate, run away across the snows, or jump into the water, meanwhile completely disrobing themselves. These attacks end in copious weeping. Brill did not observe any conversion hysteria among these women ; their mental organization was too simple, and their repressive powers too weak, he thought, for them to show anything but " anxiety-hysteria." This kind of behaviour is not simply " anxiety-hysteria," but " anxiety-hysteria " of a very elementary kind. Eight out of 20 women in the ship were affected, which is the same proportion, Brill remarked, as the number of hysterical American women to the general female population of America. Czaplicka (*op. cit.*, p. 314) also quoted cases described by Whitney in Greenland. The latter ascribed the condition partly to the gloom which descended upon everyone because of the " fearful stillness " and the feeling of " impending doom " which the arctic climate induced. Pallas was quoted by Czaplicka (p. 313) as reporting that among the Samoyedes and Yakuts, a sudden call or whistle might startle a man and induce terror in him, so that he may blindly kill someone with any weapon that might be handy ; and if he were restrained, he might scream, beat himself, roll on the ground, or rush away. Shirokogoroff (*op. cit.*, pp. 235f.) mentioned similar examples of primitive responses to stress, e.g., hiding in the dark, crying and singing, sitting on the ground, and running away to hide in rocks and bushes and not returning unless brought back by force. The elementary flight reaction, with or without disrobing, as a result of frustration, shame or rebuff is also to be found among the Cree Indians (Cooper, 1934).

It would appear that this kind of reaction, which among ourselves is commonly seen only in the immature or the mentally deficient, is widely distributed among the peoples of the " simpler " cultures, and provides illustration for Rivers' analysis (1920) of elementary " instinctive " responses to acute stress. Whether it is " hysterical " or not remains to be discussed, but it may be pointed out that it is not necessarily " abnormal " for such peoples, although it may be so for the majority of us. Among these " instinctive " responses to acute danger Rivers also mentioned the immobility reaction, which he believed to be related not only to hypnoid states, but also to hysteria (*op. cit.*, pp. 105, 130). In actual fact, it has been observed that some aboriginal peoples may show a trance-like immobility when confronted with something startling or frightening, for example, when they are brought face to face with or interrogated by Europeans. Van Loon (1928) reported this in the *orang udik* of the Indonesian jungles, and Repond (1940*a*) in the children of the aborigines of the Senegal region. It is also said that the Australian aborigines have been observed to show this reaction. The fact of being " transfixed by fear " is of course well-known and it has crept as an expression into ordinary speech.

This is the kind of behaviour which has led some authors writing on latah to call it " primitive hysteria," without attempting to account for the highly specific picture which the reaction itself presents, and also the fact that while the " primitive reaction " is so common among peoples with a lower level of culture, the latah reaction is not always to be found in every one of these. It has, for instance, never been described among the Veddahs of Ceylon or the aborigines of Taiwan. Nevertheless, it is significant that the reaction is found to be widespread only in cultures embodying a primitive level of natural knowledge and technology, in which the problem of resisting the encroaches of Nature looms larger than in our own. This is the fundamental fact in the aetiology of latah, and we need not be led astray by the existence of various hysteriform states of dissociation and " possession " which undoubtedly bear a relation to the latah co-existing with them, but are quite independent types of abnormal behaviour.

It appears that the term " primitive hysteria " is customarily used in the sense that the behaviour covered by it is exhibited by relatively simple and undeveloped personalities under the stimulation of biologically primitive impulses, which in more sophisticated personalities possessing a more complex mental organization will lead instead to the formation of those hysterical symptoms commonly seen among ourselves. We shall later see that such behaviour is perhaps better classed simply under the " primitive reactions " of Kretschmer.

" *Sleep Intoxication.*"

" Sleep intoxication," or " hypnagogic intoxication," is the term used by Brill to translate *Schlaftrunkenheit* (cf. Bleuler, 1936, p. 116), a condition Hammond compared to " jumping " when he first wrote on the latter in 1884. Sleep intoxication is a quasi-pathological phenomenon which is seen when a sleeping person, rudely awakened, shows " clouding " of the sensorium, wild and often aggressive movements, and, perhaps, on being addressed, mitigated echolalia. This condition naturally lasts only a brief moment, and is obviously related to the more familiar " sleep paralysis." Charles Dickens in *The Cricket on the Hearth* (1845) described an instance of it:

> " It was a loud cry from the Carrier's wife; a loud, sharp, sudden cry that made the room ring like a glass vessel. . . . The men were all about her in a moment. Caleb, who had been dozing on the cake-box, in the first imperfect recovery of his suspended presence of mind, seized Miss Slowboy by the hair of her head, but immediately apologized."

It is clear that pathodynamically there is a close relation between the latah reaction and the quite unexotic condition of " sleep intoxication " ; both are essentially temporary states of dissociation, when the personality is disorganized following a shock; the former occurs in persons culturally prone to fright and disorganization of the Ego, and the latter in persons with an abeyance of the highest control during sleep. However, the latah reaction with its characteristic symptomatology is also to some extent fixed by habituation, and moreover receives some degree of cultural support which succeeds in impressing on it a special form.

" *Startle Neurosis.*"

Thorne (1944) described this " neurosis " which clearly has affinities with the latah reaction, without apparently being aware of the existence of the latter or of " jumping." He described excessive reaction to simple stimuli like a slap or a nudge in three white American Army recruits, and estimated that 1 out of 2,000 recruits showed this anomaly. One of his subjects would jump right out of his chair and laugh nervously with the slightest unexpected stimulus, but was normally well-adjusted and not unduly nervous. A second would jump up with a cry, whirl round and start to tremble, but he was normally a somewhat nervous individual. His third case, on being bumped against, or " goosed " (having a finger put into his gluteal fold), or startled by having something thrown at him unexpectedly, would jump up with a yell and become genuinely distressed. He was a solitary, suspicious and irritable person, probably as a result of having been repeatedly experimented upon. He could be made to show the reaction eight times in succession without fail.

Thorne did not commit himself as to the pathological basis underlying this " neurosis," except to ascribe it to inherited " irritability of the nervous system." In this connection he pointed out the interesting fact that in training police dogs it was possible to breed a strain not prone to startle by eliminating from the stock those which showed this reaction readily. This " neurosis " is obviously very much the same thing as "jumping," and, moreover, the third case might even be regarded as an abortive case of latah.

VII. Evolution of the Concept of Hysteria.

The ancient writers understood by the term hysteria convulsive phenomena which were never clearly distinguished from the "sacred disease" or epilepsy. Thus Hippocrates in describing the latter mentioned as part of its symptoms theriomimicry, which was very probably hysterical in origin; but the convulsions regarded as hysteria were ascribed with great wisdom and insight to the frustration of the female sexual instinct. Hippocrates thought that it was due to the wanderings of the uterus, thirsting for semen; Plato similarly implicated the uterus which he thought of as an animal desirous of begetting off-spring; and Galen in a rather more oblique manner thought that it was due to the excitation of the uterus from the retention of semen. Thus the underlying notion of hysteria as a manifestation of disturbed sexuality in women which we still hold to-day has long been foreshadowed.

Further development of the concept took two directions: firstly there were continued attempts to broaden the clinical picture of the disease; and secondly speculations as to its nature accumulated. Although the convulsive aspect of the disease was always held prominent, symptoms like tremors, paralysis, anaesthesias, deafness and blindness were added to the clinical picture of the disease by Ch. Lepois; and gastralgia, laryngeal spasm, and hysterical coughing by Willis in the course of the seventeenth century. Finally, in 1681 Sydenham declared that hysteria could manifest itself by simulating every known organic disease, and could affect every system in the body. It was then, according to him, the most common of all the chronic diseases, and indeed hysteria was a favourite subject for medical treatises during that epoch. It was left to Briquet in the middle of the nineteenth century to distinguish from the usual spasms, paralyses and anaesthesias (which he called "inter-paroxystic") the strictly psychological symptoms of a "paroxystic" kind, viz., somnambulism, "ecstasy," coma, syncope, catalepsy and "lethargy." By this time the existence of hysteria in men and children were already well recognized.

Charcot towards the end of the nineteenth century undertook further to systematize the symptomatology by dividing Briquet's "inter-paroxystic" symptoms into "stigmata" or permanent symptoms, and "accidents" or transient and protean bodily symptoms of psychogenic origin. It was about this time that a clear distinction was first made between epilepsy and hysteria. Bernheim rejected Charcot's "accident" and "stigmata," and returned to the old practice of restricting hysteria to mean only the "*crise de nerfs*" or the convulsions; and he also pointed out the importance of suggestion in building up the symptomatology of hysteria as in the case of Charcot's "*grande hystérie*." The descriptive trend in the development of the concept of hysteria practically came to an end with Charcot, except for the description of the Ganser syndrome and the prison psychoses by Ganser and Siefert respectively at the turn of this century.

Attempts at analysing the nature of hysteria took two complementary courses; the French school adopted as its point of departure the structural theories of Janet (1892), and made great play with the ideas of dissociation and suggestion. The German school on the other hand took a more penetrating and dynamic view of it, influenced inevitably by the work of Breuer and Freud (1895). Freud studied with Breuer the hysterical "twilight states" ("hypnoid states"), which, in opposition to the latter, he insisted were due to a revival or reliving of early traumatic experience, mainly sexual in content. Later he elaborated the idea of failure of repression leading to "conversion" into somatic channels of libidinal energy. He regarded the "hypnoid state" as a state of dissociated consciousness, much in the same way as Janet, who explained on this basis abulia, doubling of the personality, as well as restriction of the field of consciousness in certain hysterical states. This relationship of hysteria to hypnoidal conditions is of importance for our understanding of the disease.

With the application of general psychoanalytic principles to hysteria, the psychodynamic point of view gained gradual acceptance, though not necessarily within the Freudian tradition. Gaupp (1911) first discussed the illness as a reaction-type rather than a disease, and in the same year Bonhoeffer identified the reaction as one essentially involving dissociation directed by the will in a pathological direction,

" the will to illness." This, of course, originated from Freud's idea of a " flight into illness." Jaspers (1913) also emphasized the will to sickness, and believed that the hysterical dissociation depended on mechanisms found also in hypnotic states. In becoming sick, the patient satisfied a purpose not fully conscious and at the same time obtained a morbid gain, whether it be an escape from reality or a wish-fulfilment. It was left to Kretschmer (1917, 1923) to make a searching analysis of the implications of this point of view ; he attempted a classification of hysteria based on an evaluation of the extent to which volition entered into the illness, and his later monograph was important for its study of non-volitional hysterical mechanisms (*vide infra*). Bumke (1918) pointed out that sometimes the fear of being ill might be as effective a cause of hysteria as the desire to appear ill. In general the idea of a morbid secondary gain in hysteria has been widely accepted, although Schneider (1923) has argued that such motivation is not essential for the pathogenesis of hysteria, since the illness may occur on the basis of the mechanisms that Kretschmer has emphasized, as well as the ordinary process of "forgetting" (*verlernen*) associations.

The descriptive trend in the evolution of the idea of hysteria passed from a preoccupation with the " interparoxystic " symptoms to a study of the " hysterical personality," and this aspect of hysteria has claimed much attention. It was a Frenchman, Hartenberg, who, with the acuteness of perception so typical of French psychiatrists, first attempted to delineate this type of personality (1910) ; he thought it was characterised by a lively and vivid imagination, which by means of pronounced auto-suggestibility, could give the quality of reality to its images. Bernheim (1913) held that suggestion working upon emotionally-laden ideas brought about the hysterical reaction in certain people ; but he denied that suggestibility was anything but a feature of normal psychology (in contrast to Babinski), and refused to associate suggestibility with proneness to hysteria ; nor did he believe (in contrast to Charcot and Babinski) that hypnosis was induced hysteria and that therefore hypnotizability was evidence of the disease. In later years belief in the usefulness of the concept of the hysterical personality was expressed by Jaspers (1923), who regarded it as characteristic of a person who " instead of accommodating himself to given situations and possibilities of life is under the necessity to appear more than he is both to himself and to others, and also to live more than he is able " ; and also by Bumke (1924), who incriminated the traits of suggestibility, lability, instability of the emotions, over-development of phantasy, untruthfulness, selfishness and egoism. Binswanger (1920) and Schneider (1923) denied the usefulness of the concept, the former on the ground that if the psychogenic factors were strong enough, anyone could become hysterical, and the latter on the ground that there was so little definitely known that almost every personality trait had been dubbed " hysterical." Many contemporary psychiatrists would adopt a position less sweeping and extreme : Lewis (*vide* Price, 1946), for instance, recognizes the existence of the hysterical personality, which he regards as unduly responsive, posing, pretentious, affectively labile, with unstable standards and an exuberant fancy. However, not every hysteric will possess these traits, although almost every personality of this type will show hysterical symptoms. Hysteria is potentially present in most people, as can be especially seen when they undergo extreme stress, but in these cases environment will be more important than heredity. The combination of heredity and environment will have, long before illness occurs, resulted in the formation of a hysterical personality.

Present-day Connotation of the Term.

The idea of a flight into illness with morbid gain, first stressed by Freud and Bonhoeffer, is now generally accepted as an essential feature of the hysterical reaction. The other important characteristic of this illness is the ability of the organism to utilize physio-psychological processes, normally beyond the control of conscious volition, in the task of adapting itself to its environment. This is essentially the problem of " hysterical mechanisms," and is closely related to the question whether or not a hysterical personality exists. It would be entirely in accord with the principles of modern psychopathology to conceive of the pathodynamics of hysteria as exaggerations, or distortions of physiopsychological processes present in the normal individual, and from this point of view it is clearly important to identify in the normal personality the basis of the common hysterical mechanisms. The views of Lewis, quoted above, succinctly summarize the whole matter from a clinical standpoint.

Our understanding of hysterical mechanisms comes mainly from the efforts of Kretschmer (1923; Eng. ed. 1926), whose ideas represent the clearest expression of the biological trend in the interpretation of the nature of hysteria. He said (*op. cit.*, p. ix): "such psychogenic reaction-forms are predominantly called hysterical where a tendency to dissimulation makes use of reflex, instinctive or otherwise biologically preformed mechanisms." The reflex and instinctive mechanisms he regarded as part of the "Hypoboulic Will," which in action tended to be explosive, undiscriminative, and "all-or-none" in character; being primitive, it was also suggestible, and was responsible for the phenomena of automatic obedience as well as negativism. In contrast, the "Purposive Will" was exact, discriminative and fully conscious. Normally these two wills were in dynamic opposition, but if the higher disintegrated the lower became dominant, so that dissociation of the mental organization occurred. This condition in its cognitive aspects he called "Hyponoia," meaning by it a state of lowered or relaxed consciousness. He worked out the laws governing the co-operation of reflex, hypoboulic and volitional processes. Habit-formation was according to him, a natural process which enabled experience to be transformed into physiological change. A voluntary and originally meaningful act became by habituation automatic and independent of the will and might even work against it. Habit formation did not have to be active, and purely passive disinterest of the will could lead to hysterical fixation. Furthermore, fixation could also occur through the conditioned reflex. When a reflex had been ingrained in the organism, it was maintained in a constant state of excitability, either by nervousness that was natural to the patient, or brought about by self-excitation through constant attention to morbid and horrifying things. It could also simply be a lasting effect of extreme shock (pp. 37f.).

Kretschmer's approach to hysteria was a functional one, and he did not emphasize the forms which this reaction could take. The pathogenic mechanisms he described are generally accepted, and have been utilized by Schneider (1923) and Bleuler (1923; Eng. ed. 1936) in their analysis of hysteria. The former excluded from hysteria both the hysterical personality and the "psychogenic psychoses," and confined the term to disorders of *bodily* function which were psychogenic and psychologically "bound" (*festgehaltene*). He considered that the pathogenesis of true hysteria involved dissociation through hysterical habituation and fixation of reflex activity or of vegetative function, simple "forgetting" of associations (*verlernen*), or, rarely repression. This very narrow interpretation of hysteria, is of course not accepted by contemporary psychiatrists, who recognize the "quasi-psychotic" (Lewis) forms of the disease. Bleuler (*op. cit.*, p. 554) described two types of hysteria: the first type developed in the hysterical personality (commonly female) and the symptoms, whether mental or physical, arose more from unconscious or semi-conscious complexes than from external pressure or seduction; the second type was commonly found in men, and followed some definite external event with strong affective meaning, e.g., shell-shock. This latter type was usually produced through reflex enforcement in the widest sense, as well as the will to illness ("a desire which also needs the capacity to produce a symptom, bring it to the surface, and at the same time give it permanence"). He did not make himself clear as to whether this second type of hysteria could take on quasi-psychotic manifestations, although in discussing traumatic hysteria (p. 551) he mentioned "attacks, paralyses and twilight states" in addition to "paralyses with tremors." It would appear, however, that according to his ideas the symptoms of hysteria arising from shock would be directly related to the nature of the shock itself, without the influence of any complex-determined factors; and that such symptoms would mostly be simple and undiversified.

Bleuler furthermore quite definitely distinguished from hysteria those forms where the "association reflex" (conditioned reflex) was the essential factor, e.g., constipation following enemas. Also to be distinguished were the "primitive reactions" of Kretschmer (1918), namely, "exaggerated or false simple reactions like screaming, attacks of rage, affect stupor, reactive depressions, the rare manic-like states and similar conditions." These reactions Kretschmer ascribed to a variety of subjects, who, because of constitutional predisposition, organic or biogenic mental disease, or complex-determined "sensitivity," are either unable to deliberate on the exciting stimulation or are possessed of an all-dominating affectivity.

Nor did Bleuler include under the term "hysteria" "the strong affectivity seen among savages, or the phenomena of becoming perfectly rigid from a knock on the door, or the twilight loss of clearness, and similar states, or the mass epidemics . . ."

However, he realized that the monosymptomatic hysterias of children and the monosymptomatic tremors of shell-shock graded into the primitive reactions, inasmuch as they developed more on the basis of a " false connection" (i.e., conditioned reflex, *vide* p. 494) than on a will to illness (pp. 551, 555).

In discussing hysterical mechanisms Kretschmer disdained the concepts of the psychoanalysts, which he regarded as comparable to the " mythologic and devil-incarnated concepts of the primitive mind," but he himself noted that the hypoboulic will corresponded to the Freudian " complex." It is doubtful, however, whether in terms of his own concepts he can adequately describe the important psychological processes which lie within the province of psychoanalysis ; when he talks about the " hypoboulic demon hurling a tremor," for example, he is taking liberties with his own explanatory concepts in a manner which lays him open to the same charges that he made against the Freudians. The usual run of cases of hysteria can often be meaningful and usefully analysed from the point of view of psychoanalysis, especially where physical or " conversion " symptoms occur ; but in those less common cases of mono-symptomatic hysteria which arise as a direct result of some catastrophic event, where, furthermore, the symptom is a fixation of some physiological change precipitated by fear or shock, there is clearly no need to resort to any more complex mechanism to account for it than that of reflex enforcement, habituation, or the conditioned reflex.

Thus we may conclude that hysteria cannot be diagnosed in conditions where neither the will to illness nor the presence of hysterical mechanisms in the widest sense can be discerned. The hysterical mechanisms of Kretschmer (" reflex, instinctive or otherwise biologically pre-formed mechanisms ") may play only a minimal part in the pathogenesis of most cases of hysteria, but in other cases they are all important. From the nosological standpoint, however, it might be well to exclude from the category of hysteria any case in which, although the so-called hysterical mechanisms are involved, a flight into the illness, a purpose in the illness (or a fear of the illness*) cannot be demonstrated. It should instead be classed among the fright or traumatic neuroses, or among the recently recognized group of " psychosomatic diseases " which arise on the basis of the fixation or structural organization of functional bodily changes following prolonged or intense emotional activity (cp. the " organ-neuroses " as delimited by Alexander, 1936).

VIII. The Concept of the Fright or Shock Neurosis.

The term " traumatic neurosis " was originated by Oppenheim in 1889, when his monograph on the subject appeared. Although there was little difference of opinion on the symptoms of mental disease brought on by trauma, yet there was much debate on the nature of the illness itself. Westphal and Struempell regarded these cases as organic in basis, but Schultze, Hoffman and Mendel considered that they were either examples of hysteria or neurasthenia. Charcot and the French generally insisted that they were nothing but cases of hysteria. Oppenheim advocated an organic histo-pathology to account for the illness, but his views were never widely accepted, and by the end of the First World War almost every German neurologist, thanks to the work of their psychiatric colleagues who had been actively elaborating the modern theory of hysteria, had begun to mention the significance of " morbid gain " in discussing its pathology. The frequent development of frank hysterical symptoms following trauma had led many authors to describe " traumatic hysteria," and Freud (1895) went so far as to say that there was a " pathogenic analogy " between ordinary hysteria and traumatic neurosis, which justified the broader conception of " traumatic hysteria " ; inasmuch as every experience producing the painful affects of fear, shame, anxiety or pain might be regarded as traumatic, and inasmuch as ordinary cases of hysteria could be held to spring from a series of minor, repeated traumatic experiences. Without a strict definition of the term " traumatic " this analysis, pursued logically, would deny any usefulness to the concept of traumatic neurosis. Later, in discussing the war neuroses, Freud made the important formulation that in cases where the individual was faced with violent trauma, the essential conflict was not, as in the ordinary neuroses, between the Ego and the Id, but between the Ego and the outside world, and this resulted in a rupturing of the protective mechanism for warding off undue stimulation, so that the subject is overwhelmed by massive excitation (Freud, Ferenczi and Abraham, 1921 ;

---

* Cf. Bumke's views, p. 46.

Freud, 1922). He was the first to give a theory of the traumatic neuroses as we would understand them to-day, and he has been followed by Fenichel (1934), Kardiner (1941) and Radó (1942). The work of Kardiner represents the most satisfactory study of the traumatic neuroses to date.

While Freud may be said to have pioneered the psychodynamic approach to our understanding of traumatic neurosis, Kretschmer has led the way in analysing it biologically (or psycho-biologically). The contemporaries of Oppenheim—Bonhoeffer, Gaupp and Stierlin—had paid a great deal of attention to the psychiatric effects of fear, and Stierlin had especially unrivalled opportunities of studying them in the Messina earthquake of 1908. From the varied symptoms of tremors, increased reflexes, tachycardia, polyuria, insomnia, nightmares, disturbances of sensations and consciousness, etc., Bonhoeffer had isolated his " vaso-motor symptom-complex " as the basic pathological manifestation of fright. It was the realization of the fundamental importance of fear in the aetiology of the traumatic neuroses that led eventually to the formulation of the more accurately defined concept of the " fright neurosis." Kraepelin (1913, p. 269) limited, in his *Lectures*, the traumatic neuroses to the fright neuroses (denying that the latter were the same as latent hysteria set free by trauma, though he admitted that this was in other circumstances not impossible). Kretschmer, adopting a broad biological approach, has been able to give an illuminating presentation of the relationship between the fright neuroses and hysteria. His interest in the effects of fright on the organism arose, to begin with, from his studies on hysteria (1923). He proceeded from a survey of the phenomena of the sham-death reflex in animals following fright, and discussed in the higher animals the associated reactions of analgesia, collapse, relaxation and cataleptic states. These states, he affirmed, were not only " identical with human hypnosis, but with closely related spontaneous hypnoid processes, the stupor and twilight states in fright and hysteria (p. 8). In man he recognized that fright might lead to convulsions, delirious clouding of consciousness, hypnoid states which sometimes passed into " resistive somnolent states or narcolepsy," long continued immobility and also activity arising from the " violent motor reflex."

In 1937 he summarized his views on the relation of " shock neurosis " to hysteria. Both could follow from fright, but often the two were intimately mixed. The " shock neurosis " (or fright neurosis) showed the " vaso-motor symptom-complex " and twilight states described by Bonhoeffer, as well as other " primitive " physical effects, but the hysterical reaction could also exhibit these, since a wish to escape reality or obtain a secondary gain can fixate these primitive affective processes. Theoretically, the effects of shock or fright would die away and perfect normality would return ; but, in fact, a psychic aim would in many cases work upon the instability of the organism immediately after the shock to produce various hysterical symptoms. " That is why we are unable to separate the fright neuroses from hysteria, but also cannot identify these with each other."

The terms " fright neurosis " (or " fright psychosis,"* Bleuler, Kleist) and "shock neurosis "† have been used interchangeably with each other and also with " traumatic neurosis." Classifications of these and allied reactions arising from trauma are numerous and confusing,‡ including as they do " traumatic neurasthenia," " concussion neurosis," *pavor nocturnus*, etc. There is nothing to be gained by distinguishing more than three classes of mental illness following acute trauma, viz., the organic post-concussion states, traumatic hysteria and fright neurosis or psychosis. The last is characterized by stuporose inhibitions of varying degree, clouding of consciousness, various vaso-motor disturbances, trembling, dizziness, irritability, fatigue, insomnia and nightmares, and do not last for more than a few weeks at the most. They occur in those of more or less normal personality, in circumstances which do not justify us in inferring that the illness involves a need for attention, approval, revenge, reward, or escape from reality. The fright neurosis is basically the same kind of reaction as Kretschmer's primitive reaction (*vide*, p. 51), but in addition involves a long-lasting impairment of the adaptive capacity of the subject; so that clinically it runs a rather chronic course, without complete restitution to normality. However, Bleuler (*op. cit.*, p. 494) included the fright neurosis under " primitive reaction."

---

* Henderson and Gillespie (1944, p. 68) state that the term " traumatic *psychosis* " is usually reserved for reactions following organic head injury.

† The term " shock " has undesirable physical connotations.

‡ Huddleson (1932) gives a full list of these classifications in an otherwise uninstructive book.

Both fright neurosis and traumatic hysteria may be included under the term " traumatic neurosis " if no attempt is made to distinguish the hysterical element in such cases from that which is purely a result of exaggerated fright. This term may have practical value for clinical use, but it is nevertheless a confusing one for nosological purposes, since it has been used with organic connotations and is so inclusive in meaning.

The most adequate and complete work on " traumatic neurosis " in recent years is that of Kardiner (1941). He defined it as " a type of adaptation (following traumatic experience) in which no complete restitution takes place, but in which the individual continues with a reduction of resources or a contraction of the Ego." He defined trauma as an injury to the Ego or the individual's powers of adaptation ; excessively traumatic stimuli, he believed, cause an overwhelming of the Ego, with chronic damage to the adaptive capacity and impairment of perception, co-ordination and manipulative skills, with fruitless attempts on the part of the patient to recover control over his tools of mastery. He essentially followed Freud by placing the locus of pathogenesis in the loss of control of the Ego over its environment. " From the physiological point of view," he said, " there exists a lowering of the threshold of stimulation ; and from the psychological point of view a state of readiness for fright reactions " (p. 95). It is clear that he was in fact dealing with the fright neurosis in its strict sense, although he did not use this term. We shall have occasion later to refer again to his analysis of this reaction.

I shall use the term " fright neurosis " with the connotation that Kardiner gave to " traumatic neurosis," and I do not propose to restrict the term to cover only those cases of psychiatric illness following major catastrophes (as Bleuler insisted should be done, *op. cit.*, p. 564), since it is employed in a functional and not a clinical-descriptive sense.

No discussion of the fright neurosis can be complete without a consideration of the panic state. In the past the meaning of this term has been obfuscated by the notion of " pure and impure affects," and it has never attracted much attention as a technical concept. Diethelm (1933) attempted to delimit it by defining it as " a maximal fear state which results from prolonged tension and anxiety." In panic the feeling of insecurity might lead to projections and other kinds of personality disturbances so as to bring about disintegration. Panic, he said, was never brought on suddenly or without cause, nor was it the result of an accumulation of anxiety. This would result in short-lived abreactive shouting and screaming, but panic led rather to " thinking disorder," projection and passivity feelings which were not complex-determined. Panic was the result of maximum " tension and apprehension," and was closely related to fear, in which, unlike anxiety, the frightening object was clearly apprehended.

Diethelm regarded it as part and parcel of the major affective reactions, and not a nosological category by itself. According to his formulation, panic is thus only an intense fright reaction to a clearly perceived fear-provoking object, but with elaborations such as " thinking disorder," projection and passivity feelings. Unfortunately he did not say how long he thought such panic states could last, nor is it clear what he meant by " thinking disorder." The specific symptoms he mentioned obviously could not be experienced in the acute fright reaction, or the short-lived " primitive reaction," except in so far as thought processes are disorganized and purposive behaviour to various degrees inhibited ; on the other hand, paranoid states following fright are better called such. There is little to be gained by giving panic an exact technical connotation.

IX. CASES OBSERVED IN MALAYA.

The following 7 cases were personally examined by me during a visit to Malaya and Singapore in 1949 using the Malay language as the medium of interrogation. (Several other cases were seen, but they possessed latah " mannerisms " more than symptoms, and need not be recorded). Since latah is regarded less as a disease than an eccentricity of behaviour, cases are never seen in hospital or clinic, but have to be sought for, as it were, *in situ*. Even the advanced cases are never looked upon as mad, and when I visited the Central Mental Hospital in Tanjong Rambutan, which receives all the cases of psychosis to be found in the whole of Malaya (more than

3,000 beds), I was informed by the Medical Superintendent that latah was never seen among the inmates, and indeed some doubts were expressed as to its incidence as well as its claim to nosological independence.

Anyone who has worked in Malaya, where a large population with a high degree of illiteracy is growing up in an undeveloped country, will understand the great difficulty of obtaining adequate histories from patients who often do not even know their exact age. Moreover, the process of interrogation carried out by one who is a comparative stranger is bound to inhibit people who have never been accustomed to it by schooling. Practical difficulties and the demands of etiquette alike make it impossible to submit such patients to a proper physical examination. Under these circumstances, it would be worse than useless to elaborate a formal psychiatric history for each patient, and I shall restrict such to a minimum compatible with what can reasonably be held to be true.

I shall describe them under two classes, the mild and the severe :

Mild Cases.

(1) A *nonya* (woman of Chinese racial extraction, who for two or three generations have taken largely to Malay speech, customs and manners), aged about 40, in Malacca. She had long been regarded as eccentric, and was called *goreng pisang* (fried banana) by way of a nick-name. She was employed as an odd-job cook during festivals, etc., and had a daughter and a son, who was also regarded as " silly." Her husband was a stall-holder, selling sweetmeats.

She was markedly histrionic and sensitive to attention. When persuaded she would, after a show of reluctance, start to walk about with exaggerated swaying of the hips and dance the *ronggeng* (a recognized folk-dance). At the same time she sang snatches of a love song, facing me all the time. After a little while she stopped, saying in a mischievous way that her testicles were dropping. When asked to bow she did so repeatedly, advancing all the while, and incidentally raising hails of laughter from those around. When tickled she would start to strut about as though making determined and demonstrative attempts to stride away. She was not echolalic, but when she wanted to leave and was, with some physical pressure, made to remain, she showed some confusion in speech which is typical of persons in the latah state : she had been playing cards and had hoped to win some money, and kept on reiterating this idea : " Good-night, *eh*, good-night, *untong-lah, kanah lottery, eh, kanah lottery, eh*, good-night . . . " (which may be rendered : " Good-night, eh, good-night, shall have to owe money then, win a lottery, eh, win a lottery, eh, good-night. . . . ").

She had developed these peculiar mannerisms and exhibitionistic personality traits from childhood, and her latah symptoms hardly ever went beyond this. She appeared to be a gay, mischievous and fairly intelligent person, not unusually nervous or anxious. The most genuine symptom she showed was decomposition of speech when embarrassed or discomfited.

(2) A Malay woman of about 40, the wife of a fisherman, with two children, seen in Malacca. She was a slow, stupid woman of rather elementary mentality, not easily drawn into conversation. She would not reply to questions, but when prodded in the ribs or teased she would make little attempt to defend herself beyond saying in a slow, deliberate drawl " *puki* " or " *butol* " (vulgarisms for female and male sexual organs). She would not budge from her squatting position on the floor, but kept on eyeing one in a rather puzzled manner. When commanded " Bukol ! " (" Strike ! "), she immediately said, " *Bukol lu, Bukol lu* " (" Strike you, strike, strike you "). When I accidentally dropped some coins, she at once exclaimed " *Duait kechil, ah, duait kechil* " (" Small money, ah, small money ") in some excitement, as though she was startled by the noise of the dropping coins, and had to verbalize what suddenly attracted her attention.

These coprolalic and mild echolalic symptoms were elicited without any preceding attempt to frighten or startle the patient. Nevertheless, although the patient carried on a normal life as a housewife of humble station, there was no doubt that she was a mild or incipient case of latah. I was informed, although I had no chance to test it, that she was known to be capable of rather more definite symptoms when really confused and frightened. It was difficult to determine whether she had any nervous symptoms because of her unintelligence and lack of co-operation.

(3) A *nonya*, aged 60, seen at Batu Tiga, near Malacca. Her symptoms had become noticeable 15 years previously ; during the Japanese occupation two of her four children had died within a few days of each other and her illness was said to have taken a more severe turn then. For the previous two years she had ceased to go out, because she had developed a fear of cars.

She was a thin, shy, pleasant, compliant, normally intelligent woman, of humble status but by no means coarse. When asked her age, she seemed not to know, and made play with figures—" 50, 60, 70 . . ."—giggling the while. When touched unawares, she would expostulate, accelerate and raise the pitch of whatever she happened to be saying, show word-play, or definite echolalia. Repeated touches had no effect, but sometimes a sudden gesture as if to tickle her sides would bring about a response. Her word-play usually centred round a word or phrase in itself meaningful for the situation; e.g., when suddenly squeezed in the arm, she exclaimed "*Eh, towsa, kras-elmbak, kras-elmbak* . . . " ("Oh don't, hard and soft, hard and soft . . . !"). Or she might in this state simply repeat words, e.g., "*Mampus, mampus, eh, mampus, eh, mampus, jugak* . . . " ("I'm done for, done for, eh, done for, eh, done for, so indeed . . . "). When stimulated while counting cards during a card game, she would go on and on with the counting quite needlessly as though her words had a momentum of their own. There was nothing remarkable about the echolalia she showed. She did not exhibit coprolalia. Automatic obedience was never quite convincing, and she made attempts to evade the examiner, murmuring that she was afraid of the "Japanese" doctor ("Japanese" being a term of derision). Echopraxia again was not elicited except for an occasional imitative movement.

However, I was informed that more marked symptoms could be elicited, and the person herself said that after a severe shock leading to the latah state she would not remember what had happened. That was why the condition did not really "*naik ati*" (cause psychological harm), since the amnesia protected her from the memory of the traumatic shock. She had tried taking "holy water" for a cure, but did not appear to be much troubled by the illness and was not otherwise nervous, irritable or easily fatigued.

(4) A Malay male, aged about 45, married with two children, a part-time chauffeur, seen at Kampong Bharu, Kuala Lumpur. Both his grandmother and mother had been latah, the former so severely affected that, according to the patient, a passing cat might make her jump and rush off into the jungle.

He had played at being latah in childhood, but it was only two years previously that, following his seizure by two mischievous friends, who tickled him inordinately, he discovered that he could not shake off the "habit." His colleagues were prone to make play with him, and on one occasion he nearly had a serious accident because of this.

He was a cheerful, pleasant and intelligent person, and said he did not mind a bit if his friends teased him while he was not driving. When tickled in *both flanks* simultaneously for a little while and prevented from escaping, or when suddenly startled, he would go into the latah state. He kept on laughing and twisting, expostulating all the time, but did not use obscenities. Then he began to show signs of confusion and helplessness and echo short sentences spoken in English and Chinese, as well as Malay. A fist held up for his attention would cause him to do the same, and he would also imitate the clenching and opening of the fist, but nothing more remarkable than that. Automatic obedience was shown only in so far as he stood, turned and sat down as ordered though not without hesitation and reluctance; but this was not very convincing, as he had to be constantly prodded in the sides. After a time it appeared as though he had lost interest in the whole proceedings, and escaped from our grasp. He said later that he retained only a hazy memory of all that had been done to him at the time.

He did not, however, think that he was suffering from anything more than excessive ticklishness; but it was bad enough for him to ask me if I knew of a cure for him. His friends had advised him to take a soup made from the front legs of a goat, and after having taken this he believed he had improved. He appeared to be a mild, yielding type of person, soft-spoken and gentle. He was never brought to a marked degree of disorganization during the examination but he was undoubtedly a moderate case of latah.

Severe Cases.

(5) A *seranee* woman (i.e., of Malay-Portuguese extraction), aged 70, and feeble, whose husband was an ex-fisherman, living in a depressed fishing community on the outskirts of Malacca.

She was a meek and senile woman who persisted in calling me *tuan* (Sir). She jumped at the slightest noise, and at the same time repeated it, e.g. a noise made in imitation of a dog bark; also when she was spoken to abruptly in a loud and commanding voice she would show typical echolalia. Any aggressive movement made towards her, including attempts to tickle her would bring about confused and incoherent talk, with ineffectual efforts to escape. She never exhibited coprolalia. After some time she did not have to be constantly stimulated to show these symptoms. She imitated movements of the arms made in front of her, and contortions of the face, though without any exactitude. All simple and direct commands she promptly obeyed. She became tired, rubbed her eyes repeatedly, said she was *mabok* (drunk), and begged me to desist because she wanted to be well, and attend mass that night, in preparation for the Feast of our Lady Fatimah the following day.

When composed she was fully orientated, could tell her age, and informed me that she had had four sons, all of whom had died. She could tell thrice three was nine, but thrice nine elicited a confused answer. (Like all the other patients described here, she had never been to school.)

(6) A *nonya*, aged 70, with four children, seen at Pudu, Kuala Lumpur. Her husband had been the owner of a small tin-mine, but she was living then in relative poverty. Her

maternal grandmother as well as her younger sister was also subject to latah. She had played at being latah as a child, but she did not fall prey to the illness until she was about 50 years old. The onset apparently coincided with the death of a daughter under violent circumstances.

She was quite able to attend to various domestic tasks, but was obviously showing signs of senile decay. She could not hold my address in mind for more than a few minutes, and insisted that I was a " Japanese " who during the occupation had stolen two brooches from her. Memory for more remote events in her life was easily recalled. She could do simple arithmetic quite well.

When dug in the ribs she would become incoherent, and after a short while, attempt to compose herself, throwing up her hands and chuckling. Sometimes she showed echolalia in Malay as well as Chinese and English, which last she could not understand. Her echolalia was always interrupted by protestations, and meaningless exclamations. Occasionally she would interject " *Nonok* " (vagina) and on one or two occasions made as if to touch the examiner's genitals. She was distinctly echopraxic. When a ruler was hit against the table to make a noise, she imitated the movement as well as the noise. When her patella was tapped she tapped her other knee, or the examiner's. When a lighted cigarette was held by me against my own arm, she did the same with her own cigarette, felt the burning heat, pulled it away, squealed and kept on laughing. Movements of my face she imitated on hers readily provided I had her full attention.

When I ordered her to give me her bangle she took it off, but then her son ordered her not to do so, and she never gave it to me again. When asked to dance she did it without hesitation, and stopped at once when either her son or myself asked her to do so. If the son in front of her clapped his hands, and I, also in front, and claiming partly her attention, raised mine instead, she became nonplussed, and after a moment compromised with an intermediate movement.

Eventually she moved from the room in order to urinate. She had full insight into her condition and said she did not want to be too much excited as it made her tired. She was more susceptible when worried. When actually latah she could not think clearly or do simple calculations like 3 × 3. After the bout she could not remember clearly what had happened, e.g. she could not remember that I had asked her to hand me the bangle.

She slept well enough for an old woman and was not especially troubled by dreams. She was however prone to be upset by trifling worries, especially when she got tired. She was pleasant and by no means irritable or difficult to get on with.

(7) A Malay woman, aged 50, with three children and a husband alive and well, teaching in the village school. She had been latah for more than twenty years, but the onset was not related to any special occurrence. She was seen in Bukit China, near Malacca.

She was a dull, stupid woman, with a dazed expression. She appeared listless and tired, although when made to speak she became facile and even euphoric. She could not give her age or tell how long she had been latah ; she said repeatedly that she had 17 children when she was asked, but this was obviously not true. The time she told incorrectly and persisted in this even after correction. She was incapable of sustained conversation and showed no spontaneous speech.

The remarkable feature was that she needed no stimulation in order to show the symptoms. It was a case of being permanently in the latah state. All that was necessary was in an ordinary way to engage her attention. She did not echo Malay words spoken to her in a level tone, but might do so if one spoke in an urgent manner. When asked in English, " Do you speak English ?," she at first said " No," and then merely echoed in a rough imitation of the question, which she could not have fully understood. Often when speaking she would break up her words with the typical " *eh* " so commonly used by persons subject to latah (or even normal Malay women), and then momentarily check her talk or change the phrase, the whole being an attempt to correct her speech.

On one occasion when I thrust a cigarette at her, she said, " *Kotek, Nonok* " (male and female organs) ; (it is tempting here to speculate whether this is not an example of dereistic thinking involving Freudian symbolism). Otherwise the patient did not exhibit prominently the symptom of coprolalia.

This case showed behaviour which might be considered to be phenomena based on autosuggestion. Thus when I handed her my hat she put it on, made a half-salute, spoke a few words in imitation of English, then took it off and corrected herself with an " *eh*," and grinned sheepishly. Again, when I handed her a box of matches, she started to strike a match, and blew it off. It was not necessary to give her an order to perform an action. the merest suggestion being sufficient. She also showed automatic obedience to commands, sitting and standing, and striking herself and others with great force when told to do so. Sometimes negativism would appear as, e.g., when asked to allow her pulse to be felt, she would at first hold out her wrist, and then withdraw it again. Echopraxia she showed perfectly. A match-box thrown at her she would at once throw back ; if she was hit, she would hit back although not necessarily with the corresponding limb on the same side ; if I blew some cigarette smoke from my mouth she would imitate, although not smoking herself. Hand postures she imitated exactly, so also a sniff (I had a cold then), or a cough. When I put out my tongue, she did the same, but shot it in and out, as though to tease and insult. If

I smiled or looked fierce she also affected to do so, but only if I was looking at her, and never if my attention wandered.

Her husband informed me that if the session was prolonged she would exhibit symptoms with increasing ease, so that if she was told to use a knife on someone she would obey. She would become very exhausted and faint, with eyes closed, and remain flaccid. This happened once when she ventured on to the street one day and she was frightened by an onrushing pedicab (a tricycle plying for passengers), and she had to be carried home in a coma, from which she had to be wakened by the usual methods of stimulation, water splashed on the face, etc., after some hours. As a rule she kept very much to herself at home doing ordinary household work which did not require strain or exertion. She had to be sheltered from noise and excitement, and was under those conditions less subject to insomnia and anxiety dreams, which used to trouble her.

Some general features of the latah reaction may now be pointed out. Except in the most severe and chronic cases, symptoms can only be elicited after a sudden shock, and these have to be continuously repeated if the patient is to undergo prolonged examination. These stimuli need only be quite trivial. The patient's attention must be gained, and repeated stimulation may serve simply the purpose of maintaining attention. Imitating of the movements and sounds of inanimate objects unrelated to the examiner with whom the patient is " en rapport " must be most unusual. While some of the milder cases show an evident delight in demonstrating their symptoms, the severe ones attempt to struggle against their own helplessness, showing some degree of anxiety or anger.

The commonest symptom is echolalia, followed in order by coprolalia, echopraxia, automatic obedience and echomimia (i.e., imitation of facial expression of mood and feeling). Coprolalia is commoner in coarser patients. In its mildest form the echolalia merges into the palilalia-like " decomposition of speech " (cf. Cases 1, 3), when the stream of speech is interrupted by repeated attempts at correction, on almost every occasion with an interjection denoting surprise or amusement ; it is as though the subject was speaking experimentally, groping for the right word and the correct phrase. Normal Malay speech also shows mannerisms of this kind, but of course to a much lesser degree. " Decomposition of speech " has not been described before. Nor have phenomena like the patient's striking a match when merely handed a match-box (cf. Case 7) ; this may be called " auto-suggestion," since to class it with command automatism will be to make the latter term meaningless.

I was not able to get any clear evidence that the onset of the illness dated from some frightening experience, as Sakaki so frequently found in his cases of *imu*. But several cases I saw incriminated conscious imitation of latah in childhood, later " stamped in " by " shock " as the cause of their illness (e.g., Cases 4, 6).

Latah is a disorder of women past their prime. The severity of the illness increases with age, although not all cases are progressive. The severer cases become nervous and tend to keep away from crowds and noise. Some of them sleep poorly and may be troubled with dreams of a frightening nature (e.g., Case 7), but the number of cases I studied is too small for me to be able to say how frequently this occurs or how significant it is. I found the greatest difficulty in inquiring into the sexual life of the younger cases, since these never regarded themselves as patients, and would have resented such questioning. The really severe cases are usually elderly, and they appear to be somewhat dull and easily exhausted, and under stress may actually faint or otherwise collapse without losing consciousness. The last case in my series conveyed the appearance of dementia, with flights of fatuous euphoria, and in others there were doubtless symptoms of senile dementia.

The diagnosis of established cases presents no problem, but where mild, abortive cases are concerned, it is often difficult to separate the genuine cases from those which are basically histrionic and exhibitionistic in nature.

X. PATHO-DYNAMICS.

Latah is a specific reaction produced by sudden psychological shock in naïve, undeveloped or poorly endowed personalities, and is characterized by disintegration of the mental organization and the boundaries of the Ego, with impairment of volition as well as the power of attention ; this results in the exhibition of echo-reactions and automatic obedience, associated with a minimal degree of anxiety and attempts at self-defence, which may express itself in coprolalia. The reaction occurs in all degrees of severity, and is chronic and facilitated by habituation, but is not always progressive.

It will be convenient to analyse the reaction under the following headings :

(1) The fright stimulus and proneness to fear ; (2) adaptation to fear ; the startle effect and processes of central inhibition ; (3) echo-reactions and automatic obedience and their relation to identification, fascination and hypnosis ; (4) a theory concerning the basis of Command Automatism (or automatic obedience) and the echo-reactions, with special reference to the latah reaction ; (5) coprolalia ; (6) the psychology of tickling ; and (7) ageing, habituation and hysterical gain.

The Fright Stimulus and Proneness to Fear.

The feeling of fear is the immediate affective response to a fear-provoking stimulus, clearly apprehended, but for which we are unprepared, and to which we therefore cannot adequately react. Since it must be sudden, the stimulus must necessarily be visual, auditory, or tactile, and must also occur in close propinquity to the subject. The frightening or startling quality of the stimulus depends not only on the physical characteristics of the stimulus (intensity, extensity, and suddenness), but also on the set or disposition of the subject towards fearsome stimuli.

It is possible that cultural factors may determine in a general way the proneness of a person to fear and fright. There may be developed a generalized attitude towards danger which would take the form of personality traits like wariness and self-assurance and, moreover, a person may be culturally conditioned to become afraid of certain stimuli which are neither in their physical aspects frightening nor in themselves real threats to human life or security. Thus the Ainus have a special fear of serpent spirits, and the sight of any creature remotely resembling a serpent may throw them into great fright (thereby precipitating the latah reaction). Similarly, certain Canadian Indians will throw a " primitive hysterical seizure " if they should suddenly step on a harmless type of garter-snake, toad or frog, all of which they believe to be inimical to man (Hallowell, 1934).

The stimuli precipitating the latah reaction are numerous, but they all arouse fear, either because they are intrinsically fearsome, or because they are associated with something originally frightening. Thus a cry of *rimau* (tiger) or *sirkul* (name of a spirit) will bring about the reaction in the Malay and the Tungus respectively. In the unique case described by Van Loon (1928) a woman developed the reaction following a nightmare with sexual content. It is not impossible that the latah patient may in some cases be conditioned in the Pavlovian manner to react with fright to stimuli which have been adventitiously associated with an original frightening stimulus.

The undoubted susceptibility of latah cases to fright will be further discussed in Section XI. Here we may note that the important stimulus of tickling (which gives the name to the latah reaction among the Siamese or Thais), while it is not strictly frightening in character, can produce effects both physiologically and psychologically similar to those of fright, especially if the tickling is prolonged (*vide infra*).

Adaptation to Fear : the Startle Effect and Processes of Central Inhibition.

According to the " intensity " of the stimulus and the adaptive resources of the subject, the manner in which a person reacts to immediate danger may take one of the forms described by Rivers (1920)—flight, manipulative activity, immobility or collapse with tremor. In man the last two reactions are definitely pathological, and come about when for some reason the other modes of adaptation are blocked. Both involve processes of inhibition (Rivers prefers the term " suppression," *op. cit.*, p. 31) ; in the immobility reaction inhibition is excessive and total, involving not only bodily processes, but also processes of perception, whereas in collapse inhibitory processes conflict with one another, leading to disorganization and a complete failure in adaptation. The physiological basis of these elemental reactions, which Rivers even calls instinctive, are of special significance and we shall later return to them.

It has become possible with recent interest in the startle effect (or the startle " reflex ") to identify the immediate changes in the behaviour of a person exposed to a sudden frightening stimulus. This has been extensively studied by Carne, and Hunt (1939) who noted that the almost instantaneous startle (which they regarded as a reflex) is followed by after-effects of a varied sort denoting disorganization, viz., nervous giggles, odd remarks, aimless changing of position, fear, flight and curiosity. This secondary behaviour, they pointed out, is "socially conditioned." A culturally standardized type-reaction to fright is therefore possible. (The startle reaction has been described as a "startle neurosis" by Thorne (1944) among American conscripts showing constitutional proneness to the reaction (*vide*, p. 41); this so-called neurosis, as I have pointed out, can be regarded as an abortive form of latah or "jumping.")

The physiological analysis of startle is clearly relevant to our study of the psychodynamics underlying latah. Carney and Hunt think that a disinhibition of the cortex and an excessive activity of the motor-neurones occur. That fright produces a severe disorganization of cerebral dynamics is quite evident, and in rats auditory shock may even cause convulsions (Finger, in Hunt, 1944). This disorganization very probably expresses itself in River's state of trembling and collapse,or in what Kretschmer has called "violent motor-activity."

Under extreme conditions fright may cause, not an acute disturbance of the excitato-inhibitory configuration in the organism, but a total and overwhelming inhibition, and Rivers finds the biological equivalent of this in the immobility reaction. The immobility or stuporose states following acute terror are commonly thought to be the result of generalized inhibition. Gillespie (1945) suggested how these conditions could be explained by Pavlov's observations on the *paradoxically inhibitory* effects of excessively strong or "ultra-marginal" stimulation. Pavlov (1941, p. 51) stated his Law of the limit of the intensity of stimulation as follows: "For every one of our animals there is a maximal stimulus, a limit of harmless functional strain, beyond which begins the intervention of inhibition . . . A stimulus, the intensity of which is beyond the maximum, instantly elicits inhibition, thus distorting the usual rule of the relationship between the magnitudes of effect and the intensity of excitation." In the earlier volume of the translations of his work, Pavlov (1927) stressed that inhibitory processes set in more easily if the animal was half asleep (and therefore already subjected to some degree of "internal inhibition"), or if they were of a special constitutional type (the "inhibitory type") characterized by cowardliness. "Evidently under the effect of an extremely powerful and unusual stimulus the cortical cells, which in this dog already had a tendency to inhibition, now permanently became still more susceptible to inhibition. Stimuli to which the dog had for a long time been indifferent . . . and also strong agencies which had acted before as powerful conditioned stimuli . . . produced a strong inhibitory effect upon the cortical elements, the resistance of which was now diminished. Minutest components of the extraordinary stimulus of the flood was sufficient to evoke the same abnormal reaction" (pp. 272, 316).

There can be no question about the facts that Pavlov gathered under his law of the limit of intensity of stimulation, but Pavlov unfortunately never clarified his ideas on the nature of "inhibition," and his theoretical interpretation of these phenomena needs revision. Konorski (1948) has given a highly plausible explanation of the nature of the "ultra-paradoxical phase." He denies that there is a top limit to the strength of stimulation to which a neurone may normally react. If excessive stimulation causes an inhibitory effect it is because a strong defensive "reflex" is brought into play by the stimulus, and this reaction conflicts with the conditioned reflex already set up to the same stimulus so that the latter is inhibited. In the "hypnotic phases" (i.e., whilst sleepy and in conflictful states following attempts to produce "experimental neuroses"), when paradoxical inhibition is best exhibited, the defensive excitability of the animal is increased. Thus the locus of abnormality which Pavlov localized in the centre for the conditioned stimulus Konorski localizes instead in the centre for unconditioned response, i.e., the defence reaction (pp. 121. 207).

We thus see that paradoxical inhibition rests on a fundamental biological basis, and that different animals, or the same animal under different psychological circumstances, may react with differing degrees of inhibition to excessive stimulation according to the strength and excitability of their defence reaction. The phenomena of the "ultra-paradoxical phase" in reflexology serve to elucidate and confirm under laboratory conditions the existence and nature of the inhibitory processes following exposure to excessive or traumatic stimuli. We can see how a traumatic experience can, by way of the defence reaction or "reflex," bring about a whole configuration of inhibition in the organism and paralyse normal reactions both conditioned as well as unconditioned. The "inhibition" of reflexology, according to Konorski (*op. cit.*, p. 70) is identical with Sherrington's "antagonistic (central) inhibition"; and Pavlov himself indeed used the term "reflex inhibition" in a manner compatible with Sherrington's central inhibition (*vide* Pavlov, 1927, pp. 43 f.). We may follow Sherrington and Konorski and speak in terms of configurations of inhibition without, of course, having to touch on the "micro-physiology" of the process of inhibition itself.

There need be no difficulty in conceiving of "inhibition," with its admittedly physical connotation, as having both physical and mental effects as long as we do not depart from the organismic point of view, and regard every human action as simply the explicit manifestation of urges actually to act, which implicitly are expressed in corresponding ideas and concepts, in phantasy and in dreams. The inhibition of such psycho-physical action tendencies is illuminatingly discussed by Cameron (1951).

It is appropriate here to note that Rivers (*op. cit.*) ascribed the immobility reaction to "suppression" which, apart from its physical effects, essentially involved a suppression of fear and pain; and furthermore he stated quite explicitly that his concept of "suppression" was but "one aspect of the universal physiological property of inhibition" (p. 31). Thus the immobility reaction, which has so much in common with the defence reaction, both biologically as well as physiologically, can be regarded as embodying functional arrest both in the physical as well as the psychological sphere.

The inhibitory effects of excessive fright or excessive stimulation are well recognized in neuro-psychiatry. The extreme condition of death from generalized vagal paralysis or vagal inhibition following massive stimulation, e.g., a plunge into water, may be mentioned; although the stimulation in this case is physical yet in the last analysis it must be mediated psychologically and produce an associated psychological effect. A review of this condition was made by Kayssi (1948). Narcoleptic-cataleptic symptoms following sudden and overwhelming trauma were discussed by Fabing (1946) on the basis of widespread inhibition. A generalized fear-provoking inhibition was employed by Kleist (1918) to account for the occurrence of regressive stupors in the fright-psychoses, and he has been followed by Kretschmer (1923) in his analysis of hypnoid states following fright; by Kardiner (1941) in his discussion of the symptoms of stupor, immobility, mutism and muscular paralyses in the traumatic neuroses; and by Mira (1944) in discussing regressive behaviour in traumatic war neuroses.

The psychological aspect of abnormally severe fright is perhaps best studied from the subjective and retrospective reports of patients precipitated into abnormal states by terror. Kardiner (*op. cit.*) described a case periodically going into "spells" like the initial one marking the onset of the illness; the patient described (no doubt with some elaboration) an unawareness of the existence of his body, and an inability to localise or name any part of it; he could not understand what was said, had no idea of perspective or the relation of one object to another, and had to react in the same manner to all questions. Mira (*op. cit.*) noticed that some patients would say that while paralysed by fear they were spectators and not authors of their own actions.

Our latah patients immediately after the shock show a state of confusion and helplessness, a failure of discriminative perception and intelligent elaboration of what is vaguely sensed, and a failure (or paralysis) of purposive direction of the motor apparatus. In brief, there is a total disorganization of the whole audio- and visuo-motor systems, including the speech apparatus. In the normal individual, immediate restitution takes place following fright, with attempts at regaining control of both the self and the environment. In latah patients, owing to the "weak" psychological organization of the subjects as well as a certain susceptibility to fright (*vide infra*) restitution is much delayed and for a long time incomplete. It is this state of disorganization with paralysis of purposeful thinking and acting, during which the patient feels passive and helpless and disorientated, that provides the conditions for the appearance of primitive attempts at adaptation like the echo-reactions.

It is not uncommon for the term "regressive" to be applied to such conditions following acute fear. Certainly the cases described by Strecker and Appel (1945) in the last war, and also those by McDougall (1946) during the first world war showed extraordinary symptoms very similar to the behaviour of infants, and provided we understand by "regression" not a principle of explanation but a term to describe the appearance of ontogenetically prior elements in behaviour, there can be no objection to it. It must be noted, however, that from the point of view of introspective psychology, "regression" is a rather vague concept, for the reason that apart from the efforts of Kretschmer in delineating the levels of cognitive function (1934) and that of Werner (1940) in his studies on the comparative psychology of mental development no overall and systematic account of the development of the perceptual process has been attempted. It seems best to avoid the term altogether, and speak simply of *disorganization* with the appearance of primitive elements of functioning.

Echo-reactions and Automatic Obedience, and their Relation to Identification, Fascination and Hypnosis.

The first formal description of echolalia and echopraxia (associated with coprolalia) was by Itard in 1825, and it was in a case of epilepsy. After him these symptoms were described in various organic cerebral diseases, and it was not until Merschede in 1897 that they were mentioned in connection with psychosis. Pick (1902) pointed out that they could occur in stupors, febrile infections, epileptic confusion, emergence from morphine intoxication as well as from organic brain disease. The recognition of the existence of reversible echolalic states was important, for it obviously made possible the understanding of the symptom in terms of psychological dynamics. The tendency, however, was to explain it on a neuro-pathological basis. Thus Pick (1916) thought that it was due to the release of an acoustico-motor speech reflex from disinhibition of the temporal lobe. Goldstein (1917) incriminated a lesion in the frontal lobe, the seat of "concept building," which had become pathologically isolated from the speech area. Kleist (1934) concluded that a lesion of the basal ganglia was responsible. Schneider (1938) described echo-reactions associated with grasping and sucking in various organic and toxic confusional states as well as in insulin sopor, and although he discussed the significance of Freudian identification in the genesis of the symptoms, was still inclined towards an organic pathology, adopting a position lying between that of Pick and Goldstein by incriminating a mixture of lesions of the motor and sensory cortex. There is little that is conclusive as regards the neuro-pathological basis of the echo-symptoms. It appears much more profitable to return to a holistic point of view, or at least to the position taken by Bastian as far back as 1890 when he insisted that echolalia could only appear when there was a general impairment of cerebral functioning.

It was Stengel (1936) who first attempted a psychological interpretation of the echo-reactions on the basis of "identification."* Hitherto the psychological approach had been concerned with the instinct of imitation or the conditioned reflex. The former was clearly tautological and the latter manifestly impossible as a general principle of explanation for any but the echolalia of the infant learning to speak. In 1947 Stengel studied these reactions in cases of aphasia, mental defect, chronic epilepsy, catatonic states, in the early period of speech development in infants, in states of fatigue and lack of attention, and states of clouded consciousness of various origin. (It is notable that he made no mention of the latah reaction, which is a state of clouded consciousness of psychogenic origin.) He employed the Gestalt concepts of "completion" and satisfaction of "quasi-needs" in the "behavioural field" of the subject who showed the reactions, and demonstrated that certain degrees of discrimination and selection, i.e., of attention and "rapport" on the part of the patient were essential before the echo-reactions could be exhibited. The application of field-concepts to the explanation of the formal aspects of echo-reactions is of great value, but it must be based on the idea that in showing these reactions the subject is showing essentially *adaptive behaviour*, though under rather abnormal circumstances. That this is so can be best seen by studying the normal echolalia and echopraxia of infancy.

It is well-known that infants of about three years of age show a strong tendency to imitate sounds, inarticulate at first but articulate later, as well as gestures. At this age the distinction in the infant's mind between the body-Ego and the outer world is not clear-cut, and it is on this basis that the infant, trying to adapt itself to the environment and to master it as well as to understand it, exhibits echo-phenomena. This is of course most clearly seen in the echolalia which is the forerunner of developed speech ; and also in the " mitigated echolalia " (the questioning repetition of words before its full meaning is grasped) to be observed so frequently in children learning to converse and developing their vocabulary. This was the point of view of both Janet and Baldwin, and when Piaget (1932) denied that the echolalia of infancy had any adaptive significance, but was simply unconscious imitation, he was surely unjustifiably mechanistic. Purely ego-centric, playful repetition may occur, but the echolalia need not be entirely of this nature.

---

* According to the Freudians, in the process of identification the Ego imitates, and as it were, takes another Ego into itself. Under the pressure of the Id demands the Ego assimilates its object. Identification is a primitive form of object-tie, an intermediate stage between primary narcissism and specific object-investment. It necessarily involves an alteration of the Ego (*Ichveranderung*). This mechanism begins to operate at the age of two. *Vide* Freud (1933).

Apart from the fact that echolalia arises from efforts at adaptation in special circumstances, Fenichel (1945, p. 37) has argued that imitation of the object perceived is the most primitive form of perception.* Moreover, the act of changing one's body according to the shape of the perceived object is, according to him the most primitive form of motor reaction to external stimulus (earlier even than " oral incorporation," from the Freudian point of view). It is a kind of identification, the first step towards mastery of the environment. Much the same view was taken by Stout (1938, p. 215) when he said that the most primitive kind of imitation was " a direct consequence of the principle that attention to a movement involves a tendency to make the movement." He stated further that where there was intense attention, immobility occurred and even the breath might be held. This had the purpose of more clearly apprehending the object. A state of intense concentration like this naturally led to the development of empathy, which was, of course, associated often with imitation. This important fact that hyper-attentiveness leads to imitation and an apparent inhibition of the higher forms of volition is in keeping with McDougall's view (1943, p. 272) that volition is essentially a higher form of attention.

This phenomenon has been studied in detail and from a genetic viewpoint by Berfeld under the name of " fascination " (1928). Berfeld defined this as a state of increased attention associated with motor inhibition, which if prolonged, would amount to paralysis. It involved the mechanism of identification, and was an important function of the Ego. The object of attention filled the whole Ego of the subject, as it were, and he was completely immersed in it. It was in some important respects like sleep, although the total energy of the subject was directed towards a real object and not a dream-image. It was also very closely related to hypnosis, especially as regards automatic obedience and actions like the pursuit of the fascinating object with the eyes, and indeed it might easily pass over into hypnosis. On the other hand, it was to be distinguished from other states of Ego-impoverishment (*Ichverarmung*), where the individuality was lost ; for instance, from the state of being in love, where the object, unlike that in fascination, was always desired ; and from ecstasy, where motor excitation instead of inhibition occurred. The Ego was dissociated, its perceptual function constrained, and the object of perception had, as it were, direct access to the motor apparatus normally under the control of the Ego.

There were, Berfeld pointed out, complex libidinal and economic factors involved in fascination, but in essentials there was no difference between this state in adults and the imitation of infants such as the automatic fixing of the infant's eyes on a flame, and the turning of its head to follow its every movement. He thought that such sudden and transient states of inhibition might be accounted for by the inhibiting effects of fright from stimuli of moderate intensity, but he confessed that where the echoing was concerned there was a gap between stimulus and reaction which could not be explained, certainly not by any theory of imitation. I shall outline below a hypothesis concerning the basis of echoing from this point of departure.

Command automatism (automatic obedience or suggestibility) very often goes with echoing, and this association is indeed of great help to us in arriving at an understanding of the psychological conditions which gives rise to these symptoms. Bleuler (1936, p. 152) noted that some cases of echo-reactions involve " hysteria-like " mechanisms where the echoing is due to the influence of a " conscious or unconscious wish " (as in hysteria and schizophrenia) ; while other cases are due to the " derailment " of an impulse or wish in the (wrong) direction of echoing (as in the mitigated echolalia and echopraxia of organic disease). Neither of these two mechanisms for explaining echo-reactions seems adequate. It is necessary to recognize that the echo-reactions are only one manifestation of a general state best called automatic suggestibility and any theory to explain these symptoms must also elucidate the nature of command automatism. Kraepelin himself derived the echo-reactions from command automatism.

---

* Fenichel quoted Goldstein's very instructive case of an aphasic patient who could read only if he moved his head to trace out, as it were, the letters of the alphabet before him (Goldstein, 1942). Siekmann (1932) found that one of his aphasics could not put matches together in a simple pattern unless he had first imitated the pattern by posturing himself.

The comparative rarity of command automatism in distinction to the echo-reactions is due to the fact that the former involves the interposition between stimulus and reaction of a symbolic system, i.e., speech. In essentials there is no difference between the repetition of a movement following direct perception of it and similar repetition following the presentation of the idea of it in the mind of the subject by means of words describing the movement, i.e., by means of verbal suggestion. In the case of suggestion or command automatism the response occurs on a higher level and is therefore more subject to influence by such volitional trends as may still operate in the pathological state. Thus while a patient may show negative as well as positive command automatism, he may not at the same time show the echo-reactions ; and, moreover, where echopraxia is elicited, it is very rarely negative or contrary.

We need not at this point discuss why it is that a verbal suggestion or command given to a suggestible subject inevitably leads to obedience. The basis of this obedience or suggestibility on the part of the subject is precisely that which underlies the echo-reactions, and will be discussed next in some detail. Here we may inquire into the relationship between states showing echo-phenomena and hypnosis. They doubtless vary in nature. In both the characteristic feature is a hyper-suggestibility, but hypnosis is due more to an active influence on the part of the operator than to a pathological receptiveness and passivity on the part of the subject ; hypnosis, furthermore, is not complicated by disorientation as in states of echoing with clouded consciousness, or by dementia as in such states arising on an organic basis. Hypnosis is on a rather higher plane of integration, and the hypnotized subject shows much more adaptive or goal-seeking behaviour.

What light can the theory of hypnosis throw on states of echoing and automatic obedience ? The mechanistic view represented by Hull (1933) is that hypnosis rests on hyper-suggestibility to prestige suggestion which merely shows a quantitative difference from the normal. Suggestibility depends on previous conditioning to language stimuli, or speech. In fact, Guthrie (1938, p. 174) says, " Suggestibility is the result of learning a language. When we acquire any language, such acquisition lies in associating the sounds of the language with action. . . . There is no essential difference between causing a man to perform some act by suggestion and causing him to perform that act by request." During hypnosis the subject's symbolic processes are in abeyance so that " the tendency to action arising from the experimenter's words " is not interfered with, and this abeyance arises from the fact that the subject is repeatedly told to go to sleep. Hull's views do not really explain satisfactorily how this withdrawal of symbolic activities arises as a result of suggestions to go to sleep, unless it is assumed that suggestions of sleep have intrinsically powerful suggestive effects compared with other suggestions. It is clear that when he spoke of " prestige suggestion," " withdrawal of symbolic activities," and "the tendency to action arising from the experimenter's words " he was using concepts which could not easily be reduced to associative principles. Moreover, the view that suggestibility is due to conditioning of bodily responses to speech fails to explain the echo-reactions as such, although no doubt it could be argued in a devious manner that perception of a movement or a sound gives rise to " sub-vocal speech " embodying a description of the movement or a repetition of the sound (Hull actually regarded the conditioned bodily responses as conditioned to proprioceptive stimuli arising from sub-vocal speech; and not to speech simply as mental images of words). The problem why perception should result in " sub-vocal echoing " of what is perceived, however, is still to be solved. Thus a mechanistic interpretation, however ingenious, fails to give a complete explanation of the phenomena of echoing and automatic obedience. More recent theories of hypnosis which stress the purposive goal-directed striving on the part of the subject " to behave like a hypnotized person as this is continuously defined by the operator and understood by the subject " (White, 1941), and which therefore take note of the adaptive significance of such behaviour, are of greater help.

A Theory Concerning the Basis of Command Automatism and the Ego-reactions, with Special Reference to the Latah Reaction.

The hypothesis will be advanced here that in those psychiatric conditions (e.g., fascination, states of clouded consciousness) where command automatism and echoing are exhibited the Ego is in partial dissolution, so that the " inner " and " outer fields " (Lewin) corresponding respectively to the mind of the subject and his environment become psychologically a single system. Under these circumstances automatic suggestibility can be explained by the general Gestalt principle of forces in a field seeking equilibrium. In the special case of latah the Ego dissolution is brought about by disorganization through inhibitory processes arising from fear, a fundamental aspect of the dissolution being the loss of local signature in perception.

The position arrived at by Stengel (1947) was that echo-reactions of various degrees of complexity and " completion phenomena " were responses of a " rudimentary " kind made by a subject to relieve tensions caused by interlocution, when the subject's powers of perception and expression were impaired. He did not deal adequately with the rather more elementary phenomenon of echopraxia as compared with echolalia, and did not touch at all on command automatism. Nor did he explain why a " rudimentary " response should take the form of an echo or an imitation, and I have already pointed out that he failed to recognize the unique effect of fright as a purely psychogenic factor in bringing about a state of echoing and hyper-suggestibility.

We have seen how from the biological observations of Rivers and the study of cases of stupors following shock as well as the phenomena of " paradoxical inhibition " in reflexology (pp. 72 f.), it can be inferred that generalized inhibitory processes are produced by stimulation of the organism so excessive as to be traumatic and fear-provoking. Whether or not a given stimulus is fear-provoking depends of course not only on its physical characteristics but also on its psychological meaning, which is culturally conditioned. When we are faced with the problem of interpreting the effects of neuro-physiological inhibition at the psychological level, it would be preferable to use instead of " inhibition " the term " suppression " as employed by Rivers originally to mean a fundamental inhibitory or suppressive effect found in all living processes, from the sensory-motor and reflex to the psychological.

Acute fear upsets the equilibrium of the organism and disorganizes its adaptive capacity. Suppression of active motor activity on the one hand, and of apperceptive and conative activity on the other, occurs. The organism is helpless and incapable of discriminative activity. At the same time the power of attention of the organism is impaired, inasmuch as attention is a basic manifestation of volition. Consciousness becomes reduced to the purely perceptual level, and the ability to think in terms of general classes or to detect particulars is impaired, so that only a vague likeness to dissimilarity can be perceived. All the processes of suppression may be considered to be *derived* from the immobility reaction of lower animals which of course has a primitive adaptive value. It may be presumed, however, that the organism, while almost immobilized by fear, yet strives to accommodate itself to the threat from the environment ; and in doing this concentrates its already weakened attention on to those aspects of the environment which are most directly threatening (or at the time meaningful). These must necessarily appear " concrete " in nature, rather than " abstract " and will stand out from its background. Under such circumstances it is clear that the organism can attend only to one small aspect of its environment at a time, and that such powers of reaction as it still possesses will be directed towards this. If we use the terminology of Goldstein (1947) we will say that the person's field is " narrowed " and that he is " stimulus-bound," because of an impairment of his reactive capacity. This condition of course can be brought about not only by fright, but also by the development of consuming interest in a thing and by organic brain injury. The *topological* relationships are identical with those in the state of " fascination," and the conditions of hypnotic " rapport," and they provide the conditions for the appearance of symptoms of echoing and automatic obedience.

Along with the reduction of consciousness to the level of simple perception and the weakening of attention, there is also impairment of the power of discrimination in respect of the localization of stimuli (local signature). Local signature may be considered to be a specific spatial quality of touch and also (in a less direct manner) of sight and hearing. In the latter two senses local sign arises respectively from the retinal mechanism (the retina, says Sherrington, is a group of " glorified warm-spots"), and from the sensitivity of the ear-drum to touch and pressure (inasmuch as sound stimulus can be localized even with one ear). Local signature is closely associated with " two-point discrimination " so that the latter may be taken as the measure of the former. The anatomical and physiological bases of punctate discrimination are still obscure, but there is no doubt that the process is complicated and may involve central mechanisms (*vide* the discussion by Parsons, 1940) ; but it has long been known that the perception of local sign by itself can vary under different psychological influences, being more acute after training or habituation, and less so in states of fatigue and sleepiness (Myers, 1928). It is of no importance, for the present purpose, whether this is due to varying attention or some central neurophysiological regulatory mechanism, or to both ; the fact is that it is possible for the perception of local sign to vary in acuity and be diminished in certain psychological conditions without a corresponding diminution of the perception of the sensation to which the local sign is attached.

It is probable that this is what happens during the clouding of consciousness which follows acute fright, since this state is characterized by a general weakening of attention, and although efforts may be made in the interest of adaptation to the environment to concentrate on the fearsome object, yet the level of attention attained may not be such as to enable the subject to have a clear perception of local signature in the various modalities of its senses. The effect of this is momentous, for it brings about directly a dissolution of the limits of the Ego.

Uexkull (1926) has pointed out the fundamental importance of local signature in differentiating body space (subjective space), from external space : " If we imagine ourselves as having an eye that can release colour sensations but not local signs, still that would alter nothing with regard to subjective space ; the sensations of red, green, blue and yellow would indeed arise, but the colours would remain properties of our subject, and the inner world of the subject means likewise the world as a whole. We ourselves would be emitting simultaneously sound and colour and filling the whole of space with our person. It would be impossible to show a distinction between thought and feelings on the one hand, and sense preceptions on the other, because the latter could not become the properties of objects. . . ."

" As soon as local signs appear, the whole world is transformed in a flash ; space requires a place to which colours can attach themselves . . . the red circle over there remains red, even if we are no longer looking directly at it, and by so doing it has acquired the objective existence independent of the optical activity of the subject ; on the other hand it remains dependent on the position in a space that has become objective" (pp. 50 f.).

Thus with the loss of local signature the whole world becomes absorbed into the Ego (which as the seat of perception is without local sign), and the distinction between the " I " and " Not-I " breaks down. It is not necessary of course to suggest that a complete loss of local signature need occur, but it is quite clear that any impairment of the power to perceive it, or any diminution of this quality in sensations perceived will result in a tendency to obscure the limits of the body-Ego.

It must be noted that the perception of movement does not involve the existence of local signs. Thus in the peripheral visual field, movements can be detected although the object moving is scarcely seen and certainly not localized. Wertheim (1912) in his classic experiment has shown that perception of movement is not only independent of the physical spatial translation of an object, but can even take place without the perception of a starting or ending position of an object. According to him, movement is a completely independent experiential unity. This is also the view of Uexkull (*op. cit.*, p. 63), who says that movement is perceived only when several " direction signs," which are of the same status as, but independent of, the local sign, fall within a single moment (or are comprehended within one " moment sign," which last is a constant property of the Ego).

It may be argued further that the " direction signs " will also be less clearly perceived in such abnormal states, so that the perception of movement will become vague and confused. Thus not only will the Ego-boundaries be blurred, but the localization of objects and their movements will also be unclear. The fusion of inner with outer fields makes it possible to regard the total situation of the organism in its environment as one single region where psychological forces operate in the general direction of seeking a dynamic equilibrium. The Ego, as Lewin (1926) suggests, may be regarded as a complex functional part within the psychic totality of the

" soul " (*Seele*), that is to say, one strong Gestalt within another weaker one ; we may further say that the Ego, the organism and its *milieu* can be viewed as a series of Gestalts of decreasing stability, one operating within another. Normally in the total behavioural field the distribution of forces depends on the valencies which bind the organism to the environment as well as on the intentions or quasi-needs of the organism. These valencies and quasi-needs naturally are in constant change. The resulting behaviour is steered in such a direction that tensions are sooner or later resolved. Under normal conditions the region of greatest figural stability is the Ego, and behaviour is directed in such a way as to make the forces in the behavioural field " pro-structural " to this region. In conditions where the dominance of the Ego is impaired, however, intentions and quasi-needs are weakened, and the field valences then direct behaviour. In other words, behaviour becomes relatively " contra-structural " to the region of the Ego. Echoing and automatic obedience are clearly of this nature.

When a person in the subject's environment gains his attention by means of an act of speech or otherwise, he creates a valency which demands a response from the latter, so that the tension may be reduced. If the subject is reduced to the level of perceptual consciousness, with enervated powers of apperception and expression, if he is unable clearly to localize objects and perceive movements, then not only is he unable to grasp the full meaning of his interlocutor's action but he is also unable to carry out intelligent and premeditated acts of adaptive value in response to the stimulus. The most efficient and economical way of relieving tension will then be simply to *imitate*, as best as he can the stimulus. The imitation is adaptive in a primitive manner, because it is at least some sort of an immediate response, and also because it helps to convey to the subject the full meaning of what is perceived. (It is in this latter sense that imitation has been regarded as a very elementary form of perception by Stout and Fenichel, *vide*, p. 83). Under the circumstances prevailing imitation will be the response which is quickest, most adaptive, as well as least expensive of energy. The above argument applies to the echo-reactions, but clearly command automatism is little different.

Instead of echoing a sound heard or imitating a movement seen the subject showing command automatism merely imitates the idea or image of the act presented to him through the symbols of speech. Often in command automatism the order is verbally repeated as well as obeyed at the same time. It is obvious that command automatism is on a higher level of organization in so far as it involves imitation through the intermediary of verbal symbols. It may be noted that a command need not be verbalized always, but can be indicated by an expressive gesture. In such cases there is no point in distinguishing between command automatism and echopraxia.

Thus it will be seen that in our treatment of the problem, " suggestibility " is reduced to the fact of the subject imitating directly stimuli perceived, whether they are verbalized or not, the stimuli having been presented to him by an operator who has gained his total although limited attention. The explanation for this lies not in the previous conditioning of the subject's behaviour to language, but in the fusion of the inner field of his psychological processes with the outer field of his psychological environment, following a weakening of his own Ego organization ; and the behaviour demonstrating suggestibility arises from the natural tendency of the total psychic field to structure itself in such a manner as to attain the greatest degree of equilibrium and balance the needs of the subject with the demands of his environment.

Coprolalia.

We have seen that Tourette was so impressed by the occurrence together of tics and coprolalia that he considered them, along with the echo-reactions, as primary features of his syndrome. French neurologists at that time were disposed to regard coprolalia as exteriorized tics of speech (Meige and Feindel, *op. cit.*, p. 215). No one now seriously derives the coprolalia of latah from tics of phonation, although the general view is still held that these tics can provide the physiological vehicle for the expression of coprolalia (cf. Creak and Guttman, 1935), and there is still confusion over the relation of convulsive tics to the " psychical tics," and of these latter to obsessional ideas (which are sometimes obscene in nature). In recent years Perussel (quoted by Repond, 1940*a*) has stressed the importance of obsessional anxiety in the pathogenesis of latah.

The relationship which coprolalia bears to tics, obscene obsessions and compulsive utterances is unnecessarily obfuscated by a limitation of the point of view. Various possibilities have been suggested : Creak and Guttman, as mentioned above, thought that coprolalia is superimposed on tics of speech ; Bleuler (*op. cit.*, pp. 150, 562) regarded it as a compulsive act based on an obsession, and suggested indirectly that the coprolalia of *miryachit* arose on an obsessional basis ; and others would speak of both coprolalia and obsessional ideas with an obscene content as resulting from a common psychic event (cp. the view of Kleist that " spasms of attention " cause both obsessional thinking as well as oculo-gyric crises). These are all possible ways of examining the problem, and it is important to realize that these various symptoms bear a dynamic relationship one to another. This is suggested by the case quoted by Meige and Feindel (*op. cit.*, p. 216) where the patient had to tic more strongly if he suppressed his echolalia, and could suppress a coprolalic utterance only with a cough or an " ahem ! " instead of a mere exercise of the will ; and he was able thus to exchange, as it were, one symptom with another only if he was not upset by having been startled. A complicated tic, like a compulsive utterance or an obsessional idea is experienced or carried out with a certain urgency, and once the action or experience is over there is a sense of relief and a lowering of psychic tension. From the dynamic point of view there can be little difference between the thinking of an obsessional idea with obscene content and the compulsive utterance of coprolalic words with the same meaning as the obsession, except that the latter will be more efficient in relieving tension.

However, we can find in latah nothing to suggest an underlying obsessional-compulsive disorder. Anxiety of a " free-floating " kind one may detect, especially during the latah state, but it is not associated with phobias, obsessions or compulsions. Nor is it probable, in view of the widespread incidence of latah, that the previous personality of these patients can be markedly over-conscientious or meticulous in the obsessional way, compared with normal persons. The coprolalia in latah usually consists of disconnected obscene remarks, but it may vary from mild indecent interjections of annoyance normally to be heard from the lips of vulgar people to prolonged coprolalic commentaries directed at the examiner (or persecutor). It is as a rule not shown unless the patient is stimulated or teased in order to bring on the various symptoms. It no doubt has the same function of relieving tension as in the case of obsessional-compulsive disease, only in latah the anxiety is of a superficial type generated by a threat to the Ego from the exterior, and is not purely intra-psychic as in obsessional anxiety. That most latah patients experience anxiety and resentment when they are stimulated to produce the reaction there is no doubt, and only a very few cases which are probably abortive or spurious will show indifference or delight on being made to perform.

When a person seeks to defend himself from aggression or annoyance, he may strike back bodily or make use of verbal behaviour, that is to say scolding or abuse. In the state of disorganization which is the prerequisite for the exhibition of latah the subject is clearly unable to fight back, or even to scold back in an effective manner. Under these circumstances the most economical and effective mode of retaliation is coprolalia.

It is a simple fact of observation that obscene exclamations have the most expressive force and are most effective in relieving irritation in oneself ; and similarly obscene speech of a propositional nature is most effective in conveying one's hatred and aggression on to others. The reason for this lies in the fact that obscene words as well as ideas have in the normal person been held under repression from an early age and retain their original infantile vividness as compared to other words which, not undergoing repression, have in the course of the individual's development become more and more drawn into the service of abstract and conceptual thinking. Obscene words and phrases moreover have a dramatic and concrete quality about them, or to use Freud's term, they are characterized by a vivid " mimicry of imagery." The telling of obscene jokes to the opposite sex has much the effect of developing actual physical intimacy. This general theme is discussed by Ferenczi (1916, Chap. 4).

The coprolalia of *latah mulut* (" latah of the mouth "), i.e., those cases of latah characterized by marked coprolalia, may be divided into three classes :

(a) *Curses :* e.g., *mati lu* (death to you), *mampus lu* (be you done for).

(b) *Mentioning of names of parts of the body socially tabooed :* e.g., *kotek, butol* (penis), *nonok, puki* (vagina).

(c) *Accusations of being inferior, socially or otherwise : or of being a breaker of codes :* e.g., *binatang* (animal), *babi* (pig), *orang Japun* (Japanese—a term of derision after the Japanese occupation).

While the above are not all obscene in the strict sense of the word, they all are designed as it were, to inflict the painful emotions of fear, horror and embarrassment on the victim. Mention of the genitals to somebody produces associations and images which lead to painful embarrassment and uneasiness ; curses produce fear since they are essentially magical attempts by the primitive mind to call on the supernatural to bring about some disaster ; and mention of the tabooed or placing in the category of the tabooed causes anxiety, inasmuch as taboos were originally designed by primitive man to bring about avoidance of what was full of fear and mystery. All these have power to hurt, but none more than the obscenities concerning sex.

Although from a psychological analysis of the meaning of coprolalia it is clear that they have the function of relieving tension, yet it may be questioned if they always succeed in doing this effectively. It is quite possible that in many cases, especially the advanced, coprolalic discharges are automatic habituation phenomena, and like many habits attain some degree of peripheral autonomy to become independent of the central processes of volition.

The Psychology of Tickling.

An aspect of latah which is hardly ever discussed is the fact that the reaction can be precipitated in susceptible subjects by tickling. This suggests that the stimulus of tickle may produce effects which are analogous to the stimulus of fright.

The sensation of tickling is so distinct a form of skin sensibility that it is held by some to be a specific sense modality. On the other hand, it may simply be a complex manifestation of the haptic sense, and this is probably the correct view. Be that as it may, a characteristic feature of all skin sensations is the physical intimacy of the stimuli, and because of this they possess a quality of urgency and immediacy which, if the stimuli are sudden and unexpected, renders them more capable of producing fright and the consequent accumulation of tension in the subject than exteroceptive sense stimuli. However, the effects of tickling, unlike those from fearsome stimuli, are produced without the element of surprise necessarily coming in. Indeed it is doubtful if there can be such a thing as sudden or acute tickling, and probably ticklishness does not appear until after an initial feeling of fear and after the nature of the stimulation is fully realized. Much more so than in the case of fright, it arises only if the psychological set of the subject is conducive to it, for if the subject is not prepared to be tickled the stimulation will not lead to ticklishness with its mixture of pleasant and unpleasant feeling tones, but to the perception of ordinary touch sensations in the general situation of a physical attack on the person.

It is important to note that ticklishness has a specific sexual quality about it (Dunbar, 1946, p. 387, pointed out that many languages have the same word for coitus and tickling ; and that in some folk-beliefs ticklishness is regarded as a sign of virginity). Ticklishness can only be elicited by stimulation from another person, either directly or indirectly, and in the act of tickling a special relationship is set up. This relationship presupposes a varying degree of passivity and surrender on the part of the subject in the face of someone over-powering but not really dangerous. It is of course an essential part of sex-play. Sexual tension in a woman finds a way of discharge through tickling and a markedly sexual woman or one sexually unsatisfied may behave in a manner almost as if to invite tickling; witness the alternating forwardness and withdrawal, the general sensitivity to the attentions of men and the frequent giggling of sexually mature but inexperienced adolescent girls. In such persons there appears to be a psychological set for tickling or ticklishness, and therefore a lowered threshold for it ; and it is quite possible that quite apart from natural sexuality, femininity or age this set can be influenced and moulded by cultural influences. It is thus possible for latah patients to become susceptible to tickling in a culturally determined manner. We know indeed that many early cases of latah show a coquettishness and histrionic display as if they were peculiarly prone to tickling or other kinds of sexual stimulation and excitation.

Tickling, if prolonged, causes an accumulation of nervous tension in the individual which urgently demands discharge. The natural outcome of continued tickling is the wild movements of defence and repulsion, and the spasmodic movements of laughter. Laughter has been regarded by Herbert Spencer and by McDougall (1923) as primarily a form of emotional release. Sully (1902) thought that it resulted from a state of mind where the attention was exceptionally intense and concentrated, involving a special strain on the volitional processes. This psychological set was unstable and had to break up and the redundant energy then followed the direction of the "risible muscles," because no other commanding object for the attention presented itself at that moment. The exhilaration and euphoria of laughter are in direct contrast to the heightened mental tension and concentrated attention which is produced by the initial stimulus before its playful and non-harmful nature is recognized by the subject.

In extreme cases tickling may bring about clouding of consciousness, or even loss of consciousness. I was informed by a medical student in Singapore of a case he had seen of a young Indian who was one day mischievously held and tickled by his friends in order to elicit the latah reaction he was known to show, and who fell to the ground unconscious and frothing at the mouth. When the accumulation of tension is excessive and when it is in the process of being dissipated, the subject experiences a disturbance of consciousness. He is then incapable of adaptive behaviour; and terms like "the delightful psychosis" to describe acute laughter (Sully) refer to this peculiar condition of psychological disorganization. We thus find that, like fright, tickling brings about a weakening of the volitional processes, a disturbance of apperception and very probably a dissolution of Ego-boundaries; moreover, as we can see from the bodily weakness and helplessness which accompanies laughter, tickling also causes an impairment of motor activity. We might even go so far as to say that the higher functions of adaptation are thereby "suppressed."

In latah the stimulus of tickling is, however, not as effective as fright. When it is effective it brings about a state of giggling with echolalia and coprolalia. Typically patients who succumb to tickling do not seem to mind the experiment very much, and they show little fear or anxiety. It is quite probable that in these subjects there is present a large element of hysterical display.

Habituation, Ageing and Hysterical Gain.

There appears to be a positive correlation between the severity of the latah reaction and the age of the subject. In many cases the disease appears first in adolescence in minimal form and progressively becomes more severe. Advanced cases show echo-reactions with the greatest of ease without requiring a preceding fear or tickle stimulus (e.g., Case 7). The factor of facilitation by repetition cannot be ruled out here.

Apart from this, the factor of ageing must be considered. With advancing age there is a setting in of old reactions and habits, and increasing inability to take up new methods of thinking and working. The capacity to adjust to new situations is impaired and if the latah reaction results from the damage to the powers of adaptation of the subject by relatively excessive fright, as I have argued, it is clear that advancing age will have the effect of making him more liable to show it. In practice it is always difficult to estimate how much deterioration has taken place in a patient, since they are mostly illiterate, but many do show symptoms of senility like a looseness of memory, poorness of concentration and a garrulous levity.

The problem of habituation is linked up with that of a hysterical gain possibly arising from the development of the symptoms. It must be admitted that a person in the latah state is an unusual, interesting and even a funny sight, and will be bound to attract a great deal of attention and furnish much amusement. The Malays have a custom of inviting latah women to village weddings expecting them to perform a function like that of the clown in medieval festivities in Europe; needless to say, these will only be the milder cases. Shirokogoroff (*op. cit.*, p. 247) described how cases of *olonism* were regarded by the Tungus as sources of amusement (although attempts to elicit the reaction were not always welcomed by the patient). Moreover while young women were prohibited from saying certain words with sexual connotations, no one looked down upon them if they should say these during the latah reaction. It appeared that the taboo on these words did not apply to old women, and the latter not infrequently teased the younger women with these words knowing that they were not permitted to reply in kind. Under these circumstances the latah state conferred certain liberties on the younger women. Shirokogoroff also pointed out that the incidence of latah or *miryachit* was lower in the Manchus settled in Eastern Siberia compared with the Tungus, and suggested that this might be due to the fact that the former, being agriculturists instead of nomadic hunters, cultivated more of the civilized graces, and strongly discouraged in their young coprolalic expressions and other pre-latah behaviour like playful imitation. Winiarz and Wielawski (*ibid.*) mentioned that among the Ainus *imu* was held to be a privileged condition surrounded by a religious aura, so that whereas Ainu women were normally under the domination of their men-folk, they were permitted to scold and hit the men without retaliation when they were *imu*.

It is difficult without direct experience of the cultures in question to know how far all the above-mentioned circumstances do operate to constitute a hysterical gain for latah subjects, As far as the Malays are concerned, I am certain that factors such as these contribute directly to the onset of the disease in many young women. One frequently encounters young Malay females who affect latah-like mannerisms in a coquettish way, quite obviously pleased with the attention they thereby gain. A sudden and often repeated exclamation like "*O puchok*," accompanied by a touch of the bosom with a tremulous hand in a gesture of fear and helplessness, whenever they are the slightest bit surprised, is so fetching an exhibition of feminine weakness, passivity and timidity that it must appear very becoming to young women, and is therefore bound to be cultivated by some of them ; and to others it must exercise an insidious attraction. These stereotyped mannerisms are not a far cry from the confused word-play and echoing of latah when they are startled. Again, not a few girls (and boys) will play at being latah, and out of sheer mischief and daring revel at the opportunity it affords them of mouthing obscenities in an apparently pardonable setting. Latah is regarded so much as a matter of course among the rural Malays, and it is so usual to make play with people subject to it, that they have a word for the act of prodding them to bring on the reaction, viz., *Chokok* ; and sometimes this word is even used in "horse-play" with a non-susceptible person, expressing, as it were, a threat to go on until the subject is reduced to the helplessness and discomfiture of someone in the latah state.

XI. Latah and the Malay Ethos.

Aetiological Considerations.

The latah reaction under its various local names is found in culture complexes which are by comparison with modern civilizations, both East and West, little developed. The peoples showing it (not excluding the Jumpers) are peasants, grazers, hunters and fisher-folk and are naturally possessed of unsophisticated mentalities. The widespread distribution of the reaction (*vide* attached table), ranging from the arctic to the tropics and including the temperate zone of N. America at once disposes of the theory that extremes of climate are an important aetiological factor, as suggested by Czaplicka (*op. cit.*).

The theory has also been advanced that race as such is the essential factor in the aetiology. Czaplicka, although aware of the existence of the Jumpers, was however still inclined to the view that "Mongolic race-characters" were of significance, and thought that those Russian settlers who were affected themselves were often also of Mongolic stock like the Tungus and Yakut peoples, and came mostly from the East Ural region. The importance of race was also stressed by Galloway (1922), and by van Loon (1927, 1928) who declared in a paper otherwise sober that the disorder was "a psychosis of the Malay races, rooted in the oriental psyche." In his second paper he made much of the allegedly hedonistic and unstable nature of the Malays, who were prone, as he thought, to show primitive "protopathic-instinctive" reactions to fear and danger. McDougall (quoted by Czaplicka, *op. cit.*, p. 324, f.n.) also believed that it was peculiar to mongolian peoples. Repond (1940*a*), although confining his observations to the Sahara region, dubbed it an "oriental psychosis." Manson-Bahr (1950) still repeated the notion that oriental peoples were predisposed to it. Winiarcz and Wielawski (1936) were so much under the influence of this belief that in mentioning the Jumpers they referred to them as Red Indians !

It is of course only necessary to turn again to the example of the Jumpers, who were of Caucasian stock, and also to the so-called cases of "startle neurosis" of white Americans (*vide*, p. 41) to disprove the theory that the reaction is peculiar to "orientals" ; and the examples described in North Africa occurring among the

Ethnic Distribution of the Latah Reaction.

Ethnic group.	Author and date of first important description.
Earlier American settlers of Caucasian stock	Beard, 1880.
Malays in Malaya	O'Brien, 1883.
Malays in Java	Van Brero, 1895.
Tagálogs in Philippine Islands	Musgrave and Sison, 1910.
Dayaks of Borneo	O'May, 1923.
Burmese	Bastian, 1867.
Siamese	Rasch, communicated to Scheube, 1903.
Tamils, Sikhs and Bengalis in Malaya	O'Brien, 1883.
Indians of "British India"	Van der Burg, 1897.
Hottentot half-castes	Scheben, 1900.
Kaffirs	Gilmour, 1902.
Berber-Negroids of French North Africa	Porot, 1912.
Hamitic-Negroids and Arab-Negroids of Somaliland and the Yemen	Penso, Sarnelli, 1934.
Senegalese of S. Sahara	Aubin, 1939.
Samoyedes (and other aboriginal Siberians)	Schrenck, 1850.
Laplanders	Högström, quoted by Scheube, 1903.
Ainus	Sakaki, 1903.

Semitic, Hamitic and Negroid peoples show that it is not confined to Mongolian peoples. There is, of course, also the difficulty of defining clearly what is meant by "Mongolian," just as it is not possible to define with any clarity the concept of "Aryan." It is always of dubious value to ascribe to "race" as such aetiological significance; if it means anything at all, it can only mean that certain psychological traits acquired from the cultural environment long associated with the particular ethnic group are of importance in bringing about the disease.

It is from this point of view that we must interpret the fact that Chinese persons never show the reaction unless they have been brought up from childhood in a basically Malay cultural *milieu*. A similar observation is that of Nagai (quoted by Winiarcz and Wielawski), who noted that Japanese children never succumbed to *imu* unless they had been brought up from childhood by Ainu parents. These facts emphasize that the immediate social and cultural environment of the subjects are of great significance in the aetiology. Galloway (1922) boldly (but not quite accurately) stated that latah was never found in town-dwellers. Van Loon (1927) declared that most cases were of the maidservant type who, apart from being illiterate, were habituated to obedience before their masters. Similarly Palthy (1936) and Repond (1940) found that most of their cases came from the lowest social class. My cases were all illiterate, and though not all ignorant they were all drawn from the lower strata of society.

An important aetiological factor is that of sex. The great majority of cases of latah are female, and I have already suggested that certain female characteristics may easily merge into the milder degree of the reaction. A latah male may become somewhat feminine in demeanour with his nervousness, timidity and exaggerated reactions to ordinary stimulation. Indeed when in Malacca I saw briefly a case of a man, regarded as both homosexual and latah, who walked about with a decidedly feminine gait and cultivated feminine mannerisms. Beard's Jumpers, however, were mostly men; but Beard himself pointed out that they were all quiet, and much lacking in push and aggression.

As regards age, most observers have pointed out that, while the reaction is best and most commonly seen in middle-aged women, it is also to be found in children. Abraham (1911) said it was commonest around puberty and the menopause; Palthe said it was commonest in the aged, and so also did Winiarcz and Wielawski as regards *imu*. Fletcher (1938) said that latah could start as early as the age of 6, and Repond found that all his cases developed the illness in childhood. Two of Beard's cases were aged 4 or 5. My own cases varied from the ages of 40 to 70. It is entirely possible that many children consciously play at being latah, and that some of them who are predisposed later develop the illness.

This brings up the vexed problem of morbid constitution and inheritance. It is always difficult to distinguish in a disease of this type with a wide range of severity of the symptoms how much is organically and how much socially transmitted from parent to child. The fact that latah occurs in succeeding generations and has a tendency to cling round some families has been pointed out by many authors (Beard, van Brero, Gimlette, Galloway and Repond). Fletcher (1938) recorded its occurrence in three consecutive generations. All assumed a neuropathic inheritance though they did not consider it to be the sole and sufficient cause for the disorder. It seems to me that there is little point in pursuing this topic further since no genetic studies of the problem have as yet been made; and such studies will for a long time be impracticable because the low level of education of most latah patients do not permit them to give accurate family histories. The problem is moreover complicated by the fact that the severity of latah varies so greatly in different cases, and shades so imperceptibly into the normal that in many it will be difficult to identify as a pathological reaction. It would seem from the wide distribution of the disorder within a given ethnic group and from the important fact that the Chinese and the Japanese do not exhibit the reaction unless they have previously assimilated Malay and Ainu modes of living respectively that the environmental factor is alone sufficient to cause the disorder without the aid of either individual or racial morbid inheritance.

We may finally in discussing aetiology mention the toxic theory, e.g., Abraham's view that betel-nut chewing is responsible for latah, only to dismiss it.

Ego-development and Its Cultural Background.

In studying the relationship of the latah reaction to its cultural background, the most important problem is to arrive at an understanding of the reasons for the ease with which these subjects suffer a disorganization of their Ego when confronted with something fearful and sudden. The fact that the reaction is so common in the cultures in which it is found, and the existence in all cases of at least a tolerant attitude towards it not as a disease so much as an oddity of character and behaviour suggest that the reaction does not arise from any special hazard of adjustment in certain abnormal persons, but is rather a manifestation of aspects of the personality and Ego-organization common to the individuals comprising the group.

Personality is largely organized from a constellation of temperamental traits and attitudes. The whole constellation is dynamically held together and energized ultimately by the instinctual forces, and it undergoes not only development but also dissolution. The Ego-attitudes, largely derived from the cultural *milieu*, are superimposed on, and moulded by, a nexus of temperamental traits, which are to a great extent constitutionally determined. To what degree temperamental differences contribute to the break-down of the personality it is difficult to say, but there are certainly differences in the degree to which different Ego-attitudes participate in the formation of a personality, and in this may lie the reason why some personalities are more strongly organized than others.

Allport in his classic monograph (1949, p. 428) points out that if the scores on a series of tests of temperament and attitudes for an individual are correlated, there is a tendency for scores *above the median line to correlate positively* and those below the median line to correlate negatively with each other. This suggests (to Allport) that there is in fact such a thing as a " strong " pattern of personality, or a " weak " one. Thus it is found that *scores on tests for ascendance, expansion, persistence, extroversion, self-assurance, gregariousness, socialization* (*altruism*) *and tact* (*social intelligence*) *correlate highly*. These findings imply, according to Allport, that there is underlying all personality traits " a primordial matrix of temperament, vitality and intelligence," and that there exists a " principle of integration which tends to form ever more inclusive traits." The above traits are exactly those which impress us as being the qualities of a " strong " personality in real life. A " strong " personality therefore is precisely one which shows a good measure of the traits of ascendance, expansion, persistence, extroversion, self-assurance and possibly gregariousness, both individually, and collectively as a cluster of the traits. A " weak " personality is one which not only does not possess the above traits in abundance, but will not possess a large measure of the psychologically opposite traits together in a cluster (since scores below the median line correlate negatively); therefore a "weak" personality is not from this point of view one which is simply lacking in ascendance, submissive, uncertain of itself, etc., but is rather more nondescript and unpredictable. *It lacks the basic dominating trend expressed in the direction of ascendance,* *expansion, persistence and extroversion, and is bound to be more erratic and less well-knit.* It may be regarded as more poorly integrated.*

It is a striking fact that those who commonly become latah are not possessed of " strongly integrated " personalities, for they are usually females in cultures where they grow up to be, among other things, passive and submissive ; and we have also seen (p. 112) that feminine qualities (as we commonly understand them) probably have causal significance in latah. Can we say that the cultures which show the latah reaction, or sub-cultures within them, tend to produce such " weakly integrated " personalities ? For we are faced with the problem of explaining why it is that the incidence of latah decreases so faithfully with changes in such cultures towards the universal type best seen in the life of modern cities or as we consider the higher social and educational strata within a given culture. We have to explain the cultural background of latah.

It is not permissible to make a generalization and say that the cultures which exhibit latah all tend also to encourage the development of a common type of personality. We may say that certain common characteristics of these cultures (or sub-cultures) will very probably be significantly related to personality peculiarities only to be found in those prone to latah. The one undoubted feature common to all those cultures which show latah is that they are all at a low level of technological development and have not discovered or developed techniques to master their environment to the same extent that other civilizations have. I shall try to show that this exercises an effect on the peoples of these cultures by making them generally less secure in their own *milieu* and more liable to fright reactions. In other words, not only are they relatively lacking in those qualities which make a " strongly integrated " personality, but because they lack these they are more easily disorganized by fear. I shall confine further discussion on this point to the Malay culture complex, of which I have adequate personal knowledge, but I think my conclusions on the organization of the emotion of fear in latah Malays will also hold good for all the other peoples showing the reaction.

Latah occurs almost always in people of poor education and enlightenment, and with increasing education such as for instance goes hand-in-hand with the process of " urbanizing " peasant communities its incidence undoubtedly decreases. In Malaya it is generally true to say that the majority of the inhabitants of towns and cities are more sophisticated, if not more educated, in the narrowest sense of the latter word, than those outside them.

The untutored person in Malay society, especially in the case of females, is a shy, retiring, unaggressive, self-effacing changeable and colourless person, with little individuality, inasmuch as her whole life is spent within the confines of her family, and moulded by the monotonous demands of infancy, childhood, wedlock, and motherhood in a simple and static rural environment. Anyone who has had contact with peasant peoples, and not necessarily only the Malay villagers, will agree that the above generalization is not too far-fetched. It is not suggested, of course, that every rural Malay possesses a personality of this type. This kind of personality can be contrasted with the stubborn, independent, and sometimes devious and enigmatic personalities with wider interests so often found among city-folk, either because they are moulded by the competitive economic life of the city or because people with such personalities gravitate there. The former type of personality can be called " weakly integrated " and is commonly to be found among latah patients, especially female cases. The latter type naturally has close affinities with the " strongly integrated " personality with its characteristics of expansion, ascendance, self-assurance, etc.

We may examine in detail one particular aspect of personality in which these two types probably differ, viz., the trait of fearlessness or the attitude towards what is fearsome. The ignorant rural person tends on the whole to be a more timid person than the person who is brought up amidst the noise and rush of the city (if we do not take into account specific objects of fear). To be sure, the villager will probably be less afraid of the tiger than the townsman, just as the latter will be more afraid of the noises of the jungle than the former ; but I think it is true to say that the townsman possesses a general readiness to meet threatening situations, a consciousness of his powers of adaptation, if not of defence, a self-assurance springing from greater knowledge and understanding (generally) of his physical environment than the villager, who, apart from his special knowledge arising from crude experience of certain dangerous animals and objects, is oppressed to a rather greater degree by fears of magic forces, of maleficent spirits and supernatural powers to be conciliated and propitiated. Thus he may fear many objects which are in themselves innocuous (cp. the Ainu fear of worms, etc.), and his taboos usually carry with them the urgent threat of death or immediate disaster. Anyone who has lived among people with a low level of natural knowledge and technological attainment can readily realize how real and all-pervading is the fear of the supernatural and the unknown in such an environment. People who have grown up in metropolitan areas find it difficult to imagine such a psychological " atmosphere."

---

* Th. Ribot has given a powerful expression of the same idea in non-technical language : " The most perfect co-ordination is that of the highest wills, of the great men of action, whatever the order of their activity : Caesar, or Michael Angelo, or St. Vincent de Paul. It may be summed up in a few words : unity, stability, power."—*The Diseases of the Will*, Chicago, 1915, p. 128.

The timorousness of the villager is naturally associated with the greater possibilities that he has of meeting with crude physical danger, either from wild animals or men unrestrained by the inhibitions of urban existence. The fears arising from such situations are of course additional to those which he suffers along with the urban and educated person, viz., the fears of failure, disgrace and the like, which spring not so much from direct physical threats to life as from psychological threats to his self-respect from the social environment or from his internal needs. It is not possible to generalize and say that with the increase of civilization, or as I prefer to call it in this discussion, increase of urbanization, fears operate on an ever higher level from the physical to the psychological, since the cultural background of a " simple " people may be no less complex from the psychological point of view than that of any advanced people. There is however no doubt that urban peoples are unused to the threat of physical danger in their own *milieu*.

Is there any difference in the manner in which these two—for the sake of argument, opposing—types of persons will react to sudden physical danger ? The urban or sophisticated person will not have the opportunity to meet with this without having in varying degree been trained or prepared for it. Even if, for example, he encounters dangerous animals, the probability is that he has himself sought this, and has developed a psychological set for it—a set moreover built on knowledge of his own technical superiority in coping with such dangers. On the other hand the villager or the jungle-dweller is not only conscious of his own relative inadequacy in the face of these dangers, but they are to him ever-present, always threatening, and can appear in many forms, the more so since he possesses no real knowledge which can enable him to distinguish between fact and fancy or superstition as regards these kinds of dangers. Under such circumstances, it is not possible to speak of his developing a set for danger, since a psychological set is basically a preparation for *action* to cope with something *expected* and not merely an omni-present and all-pervading danger. One can say that he will probably develop a generalized sensitivity to danger, which approximates to a certain timidity or the absence of all those traits which together form the " strong " type of personality. This is bound to be a less effective equipment for the task of coping with urgent external threat, hence the peasant will much more readily exhibit the fear-provoked disorganization of the Ego which is at the basis of latah.

The above considerations help us to understand the remarkable relationship of latah to the untutored and more " primitive " types of persons both within a given culture and also generally in those cultures embodying a low level of factual knowledge and technology. It does not appear to me probable, as it did to Repond (1940*a*), that the reason for these facts lies in a special primitive kind of mentality which is unable to deal with anxiety in the way that civilized people in Europe do. Whether or not the common mechanisms of Ego-defence are a prerogative only of " civilized " peoples is a problem open to speculation, but it is highly improbable that they in fact are. Repond failed to distinguish between anxiety arising essentially from intra-psychic causes, and that caused by immediate threat of trauma from the exterior, and he certainly over-estimated the " primitivity " of peoples who show this reaction.

Another fact of significance in the ethnological background of latah is the status and social environment of women. It is a reaction rather commoner among females, and especially is this so in the case of the Malays. I have already pointed out how the abortive form of the reaction is imperceptibly mingled with certain histrionic mannerisms shown by sexually excitable young women when surprised or playfully threatened. These are usually spontaneous and unaffected responses, though in some it will be more a matter of habit. This kind of behaviour can be understood from the psychological environment of the Malay girl, who is afforded little or no opportunity once she has reached adolescence of coming into social contact with the opposite sex. The society recognizes no such modes of social intercourse as birthday or other parties, " dating," or frank courtship, which is such an essential part of the life of young people in the universal modern culture both East and West. She does not go to school, and plays no games. If she belongs to the toiling classes, she will naturally encounter men in the course of her daily work, but that is not an occasion for the meeting of personalities and mutual discovery, except in the most superficial manner. If she belongs to a family of higher social status, she will be even more oppressed, for there is no need for her even to leave her home in the course of her daily round. In a like manner the Chinese-Malay *nonya*, who is brought up in a largely Malay environment, is very much forced to restrict her movements as well as her interests. It used to be customary to warn her off the hall and verandah after she had reached adolescence, and if she went out at all, she used to travel in a closed-up palaquin. She was never introduced to young men who might come to the house, and if she excitedly peeped through screens and curtains at the visitors, it was as much as she was allowed to do.

It is difficult to convey to someone who has not actually been to Malaya an adequate idea of the prevailing manners and customs of the different classes of people there. The picture that I have drawn above will not now be true of most parts of the country, especially near the large centres of population and economic activity, but it was, 30 or 40 years ago, certainly the state of affairs everywhere except in the townships, which have always been populated almost entirely by immigrant Chinese and have always retained a Chinese character. Manners and mode of living change very rapidly in such " plural " societies in spite of the familiar adage about the unchanging East, but even to-day it is possible to surmise the customs and mode of living of the early days when latah was extremely widespread and almost a culture trait itself.

The change in the mode of life of people in the direction of the universal modern technological civilization is responsible for the decreasing incidence of the reaction in Malaya. Parallel with this is the decreasing hold of the old Malay customs, and the gradual disappearance of the Malay-speaking *nonya* descended from Chinese immigrants.

It will not be amiss here to describe briefly the nature of the culture complex of the Malays. The Malays are a variant of a Proto-Malay racial group, with Indian, Arab and other mixtures, belonging to the Mongoloid division of mankind. The true Proto-Malays are the Jakun, Sakai, Orang laut, Semang and Pangang, who still exist as minor aboriginal tribes in the jungles of the Malay Peninsula. The latah reaction has not been described among them, but they have never been subjected to enquiry on this point. (It has been described among the Dyaks of Borneo.) The Malays proper have settled in the river estuaries, and they congregate in villages but have never been absorbed into the towns and cities, although they dwell in little settlements on the outskirts of these. Since the first century they have assimilated Hindu and Islam influences, and their religious practices are Islamic, although with the usual mixture of animism and the magic of Moslem and Hindu. Like the aboriginal Siberians they also have the institution of the Shaman, whom they call the *pawang*. No Malay manuscript or monumental record dating before the spread of Islam at the end of the 13th century exists. They use the Arabic script, and until recently their literature has been composed almost entirely of collections of proverbs, verses, novels based on Hindu and Muslim legends, works on Muslim theology, law, ethics and mysteries, and travel chronicles. Their speech is by no means unrefined, and there is a cultivated court diction.

One may generalize by saying that they are mostly a rural people, economically very backward, and with a high percentage of illiteracy. Their everyday life has been very well described by Clifford and Swettenham, and a recent account of their cultural history may be found in the volume by Winstedt (1947). They are by no means " primitive," and indeed an ever larger number of them are being drawn into the modern world-culture of radios, newspapers, nationalism and economic competition, and affected with the desire for material progress.

Latah and the Norm in Behaviour.

I have already pointed out that latah-like behaviour is so common among the Malays that most cases of latah are not considered abnormal. The latah person is never referred to as *gila* or mad. It is the same with *imu* and the nameless latah reaction of the Senegalese. Indeed there is reason to believe that Malay latah, *imu* and the "olonism" of the Tungus and Manchus may in a way be sought after by some people (*vide* pp. 106 f.). Czaplicka (*op. cit.*, p. 320) stated that arctic hysteria was regarded definitely as a disease so that even a Shaman, if he fell prey to it, had to give up his profession, or be ostracized. It is not clear which particular people in Siberia she was referring to. In any case she must have had in mind the fully developed and severe cases, which indeed are so incapacitating that they must appear to all an undoubted illness.

The question has been raised from the medico-legal point of view whether persons in the latah state can perform a criminal act. It is theoretically possible that a person in this state may impulsively wound somebody next to him, not so much like an epileptic falling in a *grand mal* fit as like the case reported by Czaplicka (*op. cit.*, p. 248) where a susceptible subject, suddenly frightened by a falling knife, seized at once the implement and stuck it into the child by his side. I am not aware of any such cases reported in Malaya, however. It has also been suggested that in the latah state, severely predisposed patients may be prevailed upon by persons taking advantage of their increased suggestibility to carry out criminal acts. Fletcher (1938) tested this possibility by ordering a woman in this condition to stab at a bolster 'dressed-up' as a man in bed with a knife; this she did in a half-confused, half-anxious manner. That such behaviour is possible there can be no doubt, and my case No. 7 was also reported to be capable of such actions. However, Fletcher with his long experience in Malaya did not record any such cases coming before the law, nor did my enquiries at the Central Mental Hospital at Tanjong Rambutan reveal any such cases known to the staff. Thus while it is theoretically possible, crimes committed in the latah state are extremely rare. This can be understood if we keep in mind the fact, as I have shown above, that the echo-reactions in the latah state are not simple reflex or mechanistic phenomena, but are exhibited only in a dynamic field structured both by the immediate needs of the subject as well as the demands from his environment. The great rarity of criminal complications from latah is in keeping with the prevailing social attitude taken towards it as, in the vast majority of cases, a harmless mannerism or at most a handicap falling more or less within the range of normal behaviour.

XII. *Nosology.*

Nosological speculations about the latah reaction have in the past been stultified by a failure to understand its psychodynamics as well as to define such explanatory concepts as hysteria, hypnotism, shock psychosis, etc. There has also been much futile theorizing about "race psychosis" while at the same time ethnological data of psychological significance have been ignored. Without a correct understanding of the nature of the reaction it was only to be expected that clinical types have been differentiated in chaotic profusion, ranging from the purely descriptive (e.g., mild chronic; mimetic, paroxysmal) to those based on some explanatory principle (e.g., hypnotism, "fear-obsession"). The authors who attempted such classifications were Ellis (1897), Abraham (1912), Ballard (1912), Galloway (1922), Fletcher (1938) and Gimlette (1939).

Apart from clinical classifications, the reaction has been included under various nosological categories, as follows:—

(*a*) *As an organic disease or neurosis:* Ellis in 1897 thought it was *petit mal* epilepsy. Tourette (1884) first regarded it as convulsive tic, and similarly Musgrave and Sison (1910) regarded it as a degenerative tic. Van Brero (1895) first called it a hereditary cerebral neurosis, and was followed by Fitzgerald (1923); this point of view was quoted in Price's *Textbook of Medicine* as late as the 1941 edition. The falseness of this view I need not further stress.

(*b*) *As hypnotism:* Beard (1880) called the reaction simply a "transcoidal reflex" and it has continued to be regarded as trance or hypnotism by several authors. Gimlette (1897) thought it was self-hypnosis and so did Galloway (1922). Abraham (1936) called it a "hypnotic state with imitation," and as late as 1950 Manson-Bahr in his standard book on tropical diseases spoke of it as a "hypnotic-like trance." These authors have not appreciated the significance of the fright stimulus which is needed to produce the reaction in all but the severest cases and have been disproportionately swayed by reports that sometimes very outlandish and simple peoples who have never seen white men before may react to the sight of them with the immobility of fascination (van Loon, Repond). To say that the latah state is hypnosis throws light on certain features of this peculiar condition of Ego-disorganization, but it is at best a partial truth and is only a very superficial analysis of latah.

(*c*) *As hysteria :* Milne-Bramwell (1903) in his classic book on hypnotism related latah not only to hypnotism but also to hysteria. Later writers have more openly labelled it hysteria without defining their understanding of the latter term. Van Loon called it " monotonous hysteria," pointing out that it arose from fear and suggestibility reacting on a " primitive " Ego. Uchimura *et. al.* (1934) regarded the Ainu form of latah as " an ancestral form of hysteria."

Both Kraepelin and Bleuler have expressed views on the nature of latah. The former probably had no first-hand experience of it, and the latter certainly had none. Kraepelin (1909, p. 157) said that it stood " in close relationship with hysteria " and Bleuler (1936, p. 153) similarly regarded the " echopraxia of primitive peoples " (meaning latah) as involving a " hysteria-like mechanism." Van Wulften-Palthe (1936) took a similar position, recognizing it as hysteriform, but definitely not hysteria ; it was, he thought, largely based on a " susceptibility to fear," and was also moulded by cultural factors. Fletcher (1938) simply said that it was " akin to a kind of hysteria called suggestion neurosis," and Manson-Bahr (1950) " a hysterical trance-like state."

I shall later examine in detail the possible relationship of latah to the hysteria.

(*d*) *As a fright reaction :* Gimlette (1897) and Gerrard (1904) both emphasised the significance of psychological shock in the genesis of latah. Van Loon (1928) who was the first psychiatrist probably to study it at first hand, called attention to it as a primitive kind of reaction to fear, like amok*. Winiarcz and his colleague (1936) held the same view with regard to *imu.* Van Wulften-Palthe, as has been pointed out above, also incriminated hypersensitiveness to fright as an important aetiological factor. No one, however, has seriously studied the reaction in connection with the commonly recognized traumatic neurosis.

(*e*) *As a special neurosis* per se : Repond (1940) concluded that latah was a primitive kind of psychoneurosis seen in peoples who, dominated by a pervading anxiety as a result of their lack of civilization, were unable to neutralize this anxiety in the way that the civilised neurotic can ; but apart from this the reaction also depended on a special constitution from infancy, a special temperament and social influences (e.g., the environment of lower classes). He denied its relation to hysteria, and took no account of its genesis from fear.

The present position may be summed up by saying that while various authors have separately stressed or attempted to stress the relevance to the reaction of hysterical mechanisms, fright, suggestibility, psychological immaturity, " primitiveness," " the oriental psyche " and social conditioning (often one of these to the exclusion of another), a coherent nosography of latah, with due consideration of the social-cultural as well as the individual-psychological factors in a dynamic context, is still wanting.

The essential features of the latah reaction may be briefly recapitulated. The patients, because of the insecurity of their primitive environment and their own lack of knowledge and undeveloped powers of mastery, have developed a general susceptibility to fear. They are therefore prone to react with fright to stimuli which are not from their nature or their physical characteristics in themselves nocuous, and in some cases these fears are culturally supported by folk-beliefs. Because of the sense of overwhelming hazard from their surroundings which cannot be organized around any one object, they are unable to develop adequately their biological apparatus of mastery, and react to fear-stimuli by a disorganization of the Ego. This involves a dissolution of the body-Ego, an obliteration of its limits, and echo-phenomena are thereupon exhibited inasmuch as they are elementary attempts both at perceiving and exploring the environment as well as at regaining control of it. During this state consciousness is clouded and volitional processes are in abeyance, and the symptoms of echo-reactions as well as command automatism are moulded by forces in the total behavioural field which is structured both by the demands of the environment as well as the needs of the subject. When the latah reaction was first exhibited in the distant past, it was psychologically understandable, and might have been predicted in the light of our general knowledge concerning topological psychology, the psychology of fear and the conditions of primitive life. However, subsequent cultural development has tended in some respects to " capitalize " on it, so that most cases of the reaction are not looked upon as abnormal but as a type of behaviour allowing of the expression of certain psychological needs in many of the subjects, as well as a recognized source of amusement and play for other members of the group. Thus it comes about that a latah person may not only have the reaction " stamped in " by repetition and habituation, but may also be motivated unconsciously or semi-consciously in the development of this aberration by the mechanism of hysterical gain.

---

* The occurrence of both latah and amok among the Malays has prompted several authors to find for both a common explanation. Thus Abraham (1912) thought that amok was merely a paroxysmal form of latah ; Ballard (1912) believed that latah was a minor hysterical attack, as amok was a major one ; R. D. Gillespie in the book edited by McDowell (1927, p. 263) made the most unlikely suggestion that amok-latah was in fact a paranoid homicidal attack of schizophrenia ; Van Loon (1928) thought that both were " protopathic-instinctive " reactions arising from the " primitive " psyche, only that amok showed a much greater degree of " dissociation " than latah ; Codet (quoted by Repond, 1940*a*) asserted that amok was related to latah, but Repond insisted that whatever relationship latah had to amok was due to racial and biological factors, not psychological. The obscurity surrounding our knowledge of amok cannot be more clearly illustrated. It suffices to say that the amok reaction lacks the definitiveness and uniqueness of latah, and until we can identify it as a nosological entity all comparisons with latah are in vain.

In what sense may it be regarded as hysteria, primitive hysteria, or hysteriform ? If we limit the connotation of hysteria to Kretschmer's fundamentally biological conception of it (*vide* pp. 48 f.), we may legitimately regard the characteristic echo-phenomena as examples of primitive, " pre-formed," and poorly organized psychological mechanisms beyond the control of the " purposive will," manifested during the hyponoic state following acute fright. This hyponoic state is characterized by a heightened suggestibility, which Kretschmer regards as responsible for negativism and automatic obedience in conditions of hyponoia and hypobulia. Like many hysterical symptoms the symptoms of latah may with repetition develop a certain autonomy of function beyond the control of the conscious discriminative will. Moreover the reaction may in a limited sense be considered to serve the subject in culturally recognized ways, although the " tendency to dissimulation " which Kretschmer insists on as a necessary element in hysteria will not be found except in some of the earlier, borderline and abortive cases. Thus in so far as there are present " reflex, instinctive or otherwise biologically preformed mechanisms " as well as (in some cases) a " tendency to dissimulation," we may reasonably call the latah reaction hysterical, or at least hysteriform.

We would not be justified, however, in saying that it is primitive or ancestral hysteria. The ordinary hysterical spasms and tremors utilize the same type of mechanisms, but we would gain nothing by calling them primitive. The reaction does not arise because of the undeveloped mentality of peoples showing it ; it is not due to a deficiency in psychic structure, but it arises directly from an abnormal hyponoic and hypobulic state, which is not peculiar to so-called primitive peoples. However the ease with which latah people can be precipitated into the hyponoic state must be admitted, and I have already suggested that this is due to a special organization of the emotion of fear, which involves a proneness to fright, due to the general insecurity associated with a low level of natural knowledge and inadequate technical prowess. Moreover, to say that latah is primitive hysteria would imply that it is the only type of hysteria seen among such peoples ; this cannot be true, in spite of the views of Uchimura (*ibid.*), for we have already pointed out that the primitive reactions of Kretschmer, which are in fact the most undifferentiated of all forms of hysteria, are very widely seen in the little-developed cultures, both those which show the latah reaction and those which do not (*vide* pp. 36 f. and *infra*). Latah on the contrary is a highly specialized form of hysteria, if we call it hysteria at all, inasmuch as it is only to be found among *some* of the many poorly developed or arrested cultures known to us.

To conceive of the reaction simply as hysteria, however, is to take a rather narrow view of it, and to ignore its fundamental relation to fear. We have seen how many of Sakaki's (1905) cases took their origin from a fright stimulus ; Gerrard's case (1904) followed a bite from a crocodile, and Van Loon (1927) mentioned a case which came on after waking from a frightening dream. Czaplicka (*op. cit.*, p. 310) quoted the case of a woman whose illness appeared after a mauling by a bear. One of my cases ascribed the real onset of his illness to what was virtually bodily assault (Case

4) and another to psychological shock following the violent death of a daughter (Case 6). This association of latah with an original acute psychological shock, although it cannot be demonstrated or proved in every case, must have more than a simple illustrative significance; the latah reaction itself is indisputably a fright reaction with peculiar elaborations following a traumatic stimulus.

The question now faces us whether the reaction can be classed among the " primitive reactions " (i.e., primitive fright reaction), the fright or shock neuroses, or traumatic hysteria. I have already reviewed the present position with regard to these nosological categories (pp. 51, 54 f.). Kretschmer's " primitive reaction " is limited to those exaggerated simple affective reactions which are disproportionate to the strength of their stimuli but not in essentials qualitatively different from what might be expected from the nature of the stimulus. It is used by some authors (e.g., Bleuler) to include fright-neurosis, and clearly this is true as far as psychopathological considerations are concerned, but clinically the primitive reaction is of much shorter duration than the fright neurosis. The latah reaction, although basically an exaggerated fright reaction, runs a chronic and sometimes progressive course and cannot therefore be regarded as a primitive reaction as such.

Often the primitive fright reaction is complicated by hysterical utilization of the " instinctive, reflex or otherwise biologically preformed mechanisms " released in the course of the reaction itself, and as Kretschmer (1937) pointed out, it is extremely difficult in actual cases of illness following a traumatic shock to distinguish the symptoms of excessive fright, or fright neurosis, from those of hysteria, or traumatic hysteria. Because latah is not regarded as abnormal unless really advanced, because it may serve as a recognized mode of emotional expression as well as a culturally welcomed source of amusement, the necessary setting for dissimulation and secondary gain is there, and therefore latah can perhaps be looked upon as traumatic hysteria.

If we take note of the fact that some cases may be progressive and the patient become severely disabled without the possibility of any compensation, and that such cases are in fact considered by all to be ill, helpless and even dangerous, then the hysterical aspects of the reaction becomes insignificant. The whole explanation does not lie in hysterical " reflex-enforcement " or hysterical habituation. It will be more accurate to regard latah as essentially a fright neurosis, with minimal hysterical elaborations.

The fright neurosis according to Kardiner (*op. cit.*, p. 79) is " type of adaptation in which no complete restitution takes place but in which the individual continues with a reduction of resources or a contraction of the Ego." (We have seen that he uses instead of the term " fright neurosis " the expression " traumatic neurosis," which for reasons stated on p. 57 is unnecessarily confused and vague; the distinction between these two terms however is purely a verbal one and raises no questions of fact). The explanation for the progressive course of some cases, those which might well be called " degenerative," can only be that some permanent damage to the adaptive capacity of the subject has been done, whether this be due to excessive stimulation or some constitutional weakness. Only this indeed can explain the difference between the primitive fright reaction, which soon passes off without any abnormal sequelae, and the fright neurosis with its prolonged or chronic autonomic and psychic symptoms and its changes in personality.

Both in fright neurosis and in latah may be discerned a varying degree of anxiety; in the former it is known to express itself in irritability, distractibility and the inability to tolerate effort of any sort, in anxiety dreams and in episodic aggression and violence; in the latter, the anxiety, irritability and abnormal sensitivity to all sorts of stimuli can be seen in moderate and advanced cases, and a mild anxiety may also be discerned during the latah state itself in all genuine cases. It is the presence of this load of anxiety, not organized into phobias, obsessions, or tics and ceremonials protecting against the original trauma, but bringing about an impairment of the Ego-resources so that the original protective devices become repeatedly employed, that accounts for the lowered level of adaptability of the patients. Irritability, as Kardiner points out, is an index of the effectiveness of adaptation.

The overwhelming of the Ego in fright neurosis is due ot the excessively intense effect of the stimulation which does not permit the Ego to react by invoking the usual mechanisms of regression, substitution or displacement. It is the peculiar feature of fright neurosis that a re-adaptation making use of these mechanisms does not take place. The reasons for this are obscure, although we may legitimately point to the significance in this respect of the previous personality. Rado (1942) has emphasized that the main factor in the causation of this kind of reaction is an attitude of retreat and submission. It is highly probable that such " weakness " of personality integration or rather the lack of what might be called " strong " personality traits and the associated Ego-attitude of fearlessness (*vide* my treatment of this topic on p. 116) is an important factor, since this cannot but magnify for the subject the frightening or threatening quality of all manner of relatively innocuous stimuli, and also at the same time lower the threshold for stimulation that can disorganize the Ego. Not every case of fright neurosis will be found thus wanting in the characteristics of a " strongly integrated personality," although undoubtedly constitutional factors are important as a predisposing cause, since the other variable factor of intensity of stimulation must be taken into account. Where latah is concerned the stimuli which precipitate it are as a rule so comparatively trivial that one would expect to find among the subjects few who possess the " strongly integrated " type of personality.

The most striking clinical difference between latah on the one hand and the fright neurosis as commonly seen on the other lies not in its mode of onset or its course, but in the echoing and command automatism. On analysis, however, the difference is superficial, for these symptoms naturally arise from states of dissociation or disorganization of the Ego which are also to be seen in the stupors and the catalepsy and twilight-states of fright neurosis. That echo-reactions are exhibited in conditions of clouded consciousness due to various causes is well-known (Stengel, 1947). It will be noted, moreover, that some cases of fright neurosis run a course periodically punctuated by acute disturbances of consciousness due to sudden psychic stimulation (probably complex-determined). Kardiner recognized a type of Ego-organization in fright neurosis with a diminished level of function and showing " periodic contraction of the Ego."

We may sum up by saying that the latah reaction is a special form of fright neurosis, with minimal hysterical features, culturally maintained, and to be found only in persons whose powers of mastery and of defence are limited by the level of their own cultural development.

XIII. *Latah and Comparative Psychiatry.*

In a brief paper on comparative psychiatry (Yap, 1951), I concluded that mental diseases essentially different from those seen in countries where the structure of modern psychiatry has been erected do not occur, although the detailed symptomatology of the various psychiatric reactions may differ. I suggested that the concept of abnormality in modern psychiatric practice needed reconsideration when inter-cultural psychiatric studies were made, since beliefs and customs, conflicts and modes of resolving them differed widely ; but the theoretical apparatus of orthodox psychiatry, i.e., its explanatory concepts and principles, wherever divested of implicit reference to an arbitrary norm of behaviour, could usefully be employed to analyse the nature of unusual behaviour everywhere.

The latah reaction is not something unique, but has been shown to be understandable dynamically as a fright neurosis, and its peculiar symptomatology have been found to be explainable by the principles of topological psychology. What may be learnt from the comparison of latah with fright neurosis as commonly known ?

We may note that cultural influences can greatly distort the *form* of a fright neurosis : the latah reaction, so wide-spread in those communities where it has been described, provides a standard type on which abnormal fright reactions may pattern themselves ; it is this cultural effect which makes it so monotonous and so fixed, in comparison with the fright neuroses elsewhere.

If we then ask why such a form of fright neurosis should occur only in cultures of low technological level, we touch on a fundamental problem concerning cultural differences in the organization of emotions, in this case, fear. It has been stressed by Gorer (1950) that the expression and organization of emotions " common to members of a society " are culturally modified and transformed, in the same manner that physiological drives undergo cultural modification (a fact studied in detail by Malinowski, 1941). Once we depart from a purely biological discussion of fear we are faced with the need to determine for each culture the time, place and situation necessary for the expression of fear, its maximum and minimum limits of tolerance, and its consequences. The latah reaction furnishes an example of the psychiatric significance of this concept. Without taking into account the special fear organization of the peoples showing latah it is not possible to arrive at a basic understanding of it, with the result that it will be presented as a " special neurosis," etc. in the most superficial manner. That the organization of fear is distinctly different in cultures where latah is known can be accepted without difficulty, but whether it is also true that this kind of organization of fear is common to all cultures of low scientific and technological development (in the widest sense of the word), whose people have a greater sense of hazard from their surroundings owing to their deficient powers of mastery, is a problem for further elucidation. I have tried to suggest that this special fear organization consists in a susceptibility to react with fright to an unusually wide range of stimuli, and a fright reaction uncommonly intense, characterized by a tendency to Ego-disorganization ; and possibly there is in such a group showing this type of fear organization a comparative rarity of personalities with the traits of ascendance, expansion, self-assurance, persistence and the like.

Further investigations into the myths, folk-beliefs, proverbs, literature and drama (and in the case of the Malays also perhaps the cinema) of these ethnic groups in order to elucidate group-attitudes towards fear, violence, heroism and conquest could render more meaningful this concept of their fear organisation. Direct personality studies of peoples showing latah and those who do not would be difficult except on an impressionistic basis, but it should be possible to compare with objective methods the personality structure of latah patients and those not subject to it within a given culture. Further, whether or not latah occurs because the subjects are too primitive in their mentality to be able to convert or otherwise neutralize anxiety should be capable of solution by recording the incidence of the classical forms of psychoneurosis among them ; but this requires psychiatric observation which can be performed only through an established psychiatric clinic. These are possible lines for future research, but there may soon be little opportunity left to carry it out, since with the cult of modernization everywhere the latah reaction may, before we realize it, become a psychiatric curiosity of the past.

XIV. Summary.

A critical review of the literature on latah is given in Sections I and II, and the hitherto unsatisfactory treatment of the subject is pointed out. In Section III a full account is given of the Jumpers because of their importance as an example of the latah reaction occurring among people of Caucasian stock in a temperate climate. Sections IV and V deal with *miryachit* and *imu*, including a review of the relevant literature.

In Section VI the latah reaction is related to " sleep intoxication " and the so-called " startle neurosis," and differentiated from convulsive tics and " primitive hysteria." The meaning of the last is examined and it is suggested that the behaviour covered by it should be included under Kretschmer's " primitive reactions." The meaning of hysteria is discussed in Section VII and Kretschmer's analysis of it is regarded as the most adequate. It is suggested that where a morbid gain cannot be demonstrated hysteria should not be diagnosed even though " hysterical mechanisms " are involved ; but instead the case should be classed with fright neurosis or the psychosomatic organ neuroses. In Section VIII the term " fright neurosis " is shown to be preferable to " traumatic neurosis " and is distinguished clearly from organic post-concussion states, traumatic hysteria and the primitive reactions.

In Section IX cases observed personally by me in Malays are described, and two hitherto unnoticed symptoms as well as the general features of latah are discussed.

Section X is devoted to the pathodynamics of the reaction. The factors of fright, tickling, habituation, aging and hysterical gain are dealt with. Latah is considered to be essentially an intense fright reaction involving disorganization of the Ego and obliteration of the Ego-boundaries. A theory of automatic obedience and the echo-reactions is given : this states that fright provokes inhibitory processes which bring about " suppression " (Rivers) of perceptual activity ; impairment of the perception of local signature leads to a dissolution of the boundaries of the Ego as has been shown by Uexkull, so that the patient's behaviour becomes more directly determined by forces in the total behavioural field according to Gestalt principles ; this manifests itself in echo-phenomena and automatic obedience. Coprolalia is interpreted as a symbolic (verbal) defensive act. The affinities of the latah state to hypnosis and fascination are discussed.

Section XI critically reviews such aetiological theories as have been put forward. A special modifying of personality and of the organization of fear in persons belonging to cultures of low technological level is suggested. The nosological position of latah is dealt with in Section XII, and it is concluded that latah is a specialized form of fright neurosis, with minimal hysterical features, culturally maintained, and found only in persons whose powers of mastery and of defence are limited by the level of their own cultural development.

In Section XIII it is pointed out that organization of the different emotions varies with the cultural *milieu* and that it is of great importance for comparative psychiatry to recognize this; the usefulness of applying the concept of a special fear-organization to the analysis of latah is stressed. Finally, some suggestions for further research are given.

XIV. Bibliography.

Abraham, J. J. (1912), *Brit. Med. J.*, i, 438.
Idem (1936), *The Surgeon's Log.* London, 18th ed.
Alexander, F. (1936), *Medical Value of Psychanalysis.* New York.
Allport, G. W. (1949), *Personality: A Psychological Interpretation.* London.
Andrianjafy, M.* (1902), *Le Ramenajana á Madagascar. Thése de Montpellier.*
Ascher, E. (1948) *Amer. J. Psychiat.*, **105**, 267.
Aubin, H. (1939), *Ann. méd.-psychol.*, **97**, i, 181.
Bagenoff, J.* (1911), *Arch. Neurol. Bucarest.*, **2**, 11.
Ballard, E. F. (1912), *Brit. Med. J.*, i, 652.
Bastian, A.* (1867), *Reisen in Siam im Jahre 1863.* Jena.
Beard, G. M. (1880), *J. Nerv. Ment. Dis.*, **7**, 487.
Berfeld, S. (1928), *Imago*, **14**, 76.
Bernheim, H.* (1913), *L'Hystérie.* Paris.
Binswanger, O.* (1920), *Schweiz. med. Wschr.*, **1**, 713.
Bleuler, E. (1936), *Text-book of Psychiatry.* New York. (Trans. from the 4th German edition, 1923, by Brill.)
Bonhoeffer, K.* (1911), *Allg. Z. Psychiat.*, **68**, 371.
Brero, P. C. J. van (1895), *Allg. Z. Psychiat.*, **51**, 939.
Brill, A. A. (1913), *J. Nerv. Ment. Dis.*, **40**, 514.
Bumke, O.* (1918), *Berl. Klin. Wschr.*, **55**, 1185.
Burg, P. van der* (1897), *De Geneesheer in Indië.* Amsterdam.
Cameron, D. E. (1951), *Amer. J. Psychiat.*, **107**, 701.
Carney, L., and Hunt, W. A. (1939), *The Startle Pattern.* New York.
Castellani, A., and Chalmers, A. J. (1919), *Manual of Tropical Medicine.* London.
Christian, H. A. (1949), Osler's *Principles and Practice of Medicine.* New York, 15th ed.
Clifford, H. (1897), *In Court and Kampong.* London.
Codet, H. (1927), *Prog. Med.*, **42**, 241.
Cooper, J. H. (1934), *J. Abnorm. Social Psychol.*, **29**, 10.
Creak, M., and Guttmann, E. (1935), *J. Ment. Sci.*, **81**, 834.
Czaplicka, M. A. (1914), *Aboriginal Siberia.* Oxford.
Diethelm, O. (1933), *Amer. J. Psychiat.*, **13**, 1295.
Dunbar, F. (1946), *Emotions and Bodily Changes.* New York, 3rd ed.
Ellis, W. Gilmore (1897), *J. Ment. Sci.*, **43**, 32.
Fabing, C. H. D. (1946), *Arch. Neurol. Psychiat.*, **55**, 353.
Fenichel, O. (1934), *Outline of Clinical Psychoanalysis.* New York.
Ferenczi, S. (1916), *Contributions to Psychoanalysis.* London.
Fitzgerald, R. D. (1923), *Trans. Far East. Ass. Trop. Med.*, **148**.
Fletcher, W. D. (1908), *Lancet*, ii, 254.
Idem (1938), *Brit. Encyc. Med. Pract.* London, vol. **7**, 640.
Forbes, H. O.* (1885), *A Naturalist's Wanderings in the Eastern Archipelago.* London.
Freud, S. (1922), *Beyond the Pleasure Principle.* London.
Idem (1933), *New Intro. Lectures on Psychoanalysis.* New York.
Idem, Ferenczi, S., and Abraham, K. (1921), *Psychoanalysis and the War Neuroses.* London.
Galloway, D. J. (1922), *J. Straits Br. Asiat. Soc.*, No. 85, 140.
Gaupp, R.* (1911), *Z. ges. Neurol. Psychiat.*, **5**, 457.
Gerrard, P. N. (1904), *Dublin J. Med. Sci.*, **118**, 13.
Gilliespie, R. D. (1945), *Brit. Med. J.*, i, 653.
Gilmour, A.* (1902), *Scot. Med. Surg. J.*, **10**, 18.
Gimlette, J. D. (1897), *Brit. Med. J.*, ii, 455.
Idem and H. W. Thomson (1939), *A Dictionary of Malay Medicine.* London.
Goldstein, K.* (1917), *Ergebn., Neurol. Psych.*, **2**, 349.
*Idem** (1942), *Bull. Forest Sanatorium*, **1**.
Idem (1947), *Trans. Amer. Neurol. Ass.*, **72**, 35.
Gorer, G. (1950) *Science News*, No. **18**, 105.

Guthrie, E. R. (1938), *The Psychology of Human Conflict.* New York.
Hallowel, A. I. (1934), *J. Abnorm. Social Psychol.*, **29**, 1.
Hammond, W. A. (1884), *Brit. Med. J.*, ii, 759.
Hartenberg, P.* (1910), *L' hystérie et les hystériques.* Paris.
Henderson, D. K., and Gillespie, R. D. (1944), *Text-book of Psychiatry.* London, 6th ed.
Hirsch, A. (1886) *Handbook of Geographical and Historical Pathology.* London. (Trans. from the second German ed. by Creighton.)
Holloway, M. (1951), *Heavens on Earth.* London.
Howard, R. (1910), *J. Trop. Med. Hyg.*, **13**, 269.
Huddleson, J. H. (1932), *Accidents, Neuroses, Compensation.* London.
Hull, C. L. (1933), *Hypnosis and Suggestibility.* New York.
Hunt, J. McV. (1944), *Personality and the Behaviour Disorders.* New York.
Janet, P.* (1892), *État Mental des Hystériques.* Paris.
Jaspers, K. (1923), *Allgemeine Psychopathologie.* Berlin, 3rd ed. (French trans. by Kastler et Mendousse, 1928, Paris.)
Kardiner, A. (1941), *The Traumatic Neuroses of War.* Washington. Psychosom. Dis. Monog. II–III.
Kayssi, A. J. (1948), *Brit. Med. J.*, i, 131.
Kleist, K.* (1934), *Kriegsverletzungen des Gehirns.* Leipzig.
Kloss, Boden (1923), *J. Malaya Br. R. Asiat. Soc.*, **1**, 254.
Kraepelin, E. (1909) *Lehrbuch der Psychiatrie.* Leipzig, 8th ed., vol. **1**.
Idem (1913), *Lectures on Clinical Psychiatry.* London, 3rd. ed. (Trans. from the second German ed. by Johnstone.)
Kretschmer, E.* (1917), *Z. ges. Neurol. Psychiat.*, **37**, 64.
*Idem** (1918), *Der Sensitive Beziehungswahn.* Berlin.
Idem (1926), *Hysteria.* New York. (Trans. from the original German ed., 1923, by Boltz).
Idem (1937), *Brit. Med. J.*, ii, 574.
Lewin, K. (1926), *Psychol. Forschung.*, **7**, 294.
Lewis, A. (1946), Price's *Text-book of the Practice of Medicine.* London, 7th ed.
Logan* (1849), *J. Indian Archipelago, Calcutta*, **3**, 457.
Loon, F. H. G. van (1927), *J. Abnorm. Psychol.*, **21**, 434.
Idem (1928), *Brit. J. Med. Psychol.*, **8**, 264.
Malinowski, B.* (1941), *Sigma Xi Qtrly.*, **29**, Nos. 3, 4.
Manson, P. (1912), *System of Medicine*, ed. by Allbutt and Rolleston, London, 2nd ed., vol. **2**.
Manson-Bahr, P. H. (1950) Manson's *Tropical Diseases.* London, 13th ed.
Mayer, E. E. (1927), *Amer. J. Psychiat.*, **6**, 523.
McDougall, W. (1943), *Outline of Psychology.* London, 9th. ed.
Idem (1946), *Outline of Abnormal Psychology.* London, 5th ed.
McDowell, R. J. S. (1927), (Editor), *The Mind.* London.
Meige, H., and Feindel, E. (1907), *Tics and their Treatment.* London. (Trans. from the French by Kinnier Wilson.)
Milne-Bramwell, J. (1903), *Hypnotism : Its History, Theory and Practice.* London.
Mira, E. (1944), *Psychiatry in War.* London.
Moreira, J. (1924). *Handbuch der Tropenkrankheiten*, edit. by Mense, Berlin, vol. **4**.
Musgrave, W. E., and A. G. Sison (1910), *Philip. J. Sci. B*, **5**, 1335.
Myers, C. S. (1928), *Text-book of Experimental Psychology.* Cambridge, 2nd ed., vol. **2**
Natoli, A.* (1937), *Gior. ital. Clin. Trop.*, **1**, 20.
Neale, R. (1884), *Brit. Med. J.*, i, 39.
Novakovsky, S.* (1924), *Ecology*, **5**, 113.
O'Brien, H. A. (1883*a*), *J. Straits Br. Asiat. Soc.*, No. 11, 143.
Idem (1883*b*), *ibid.*, No. 12, 282.
O'May, J. (1923) *J. Malaya Br. R. Asiat. Soc.*, **1**, 381.
Ormerod, J. A. (1912), *System of Medicine*, ed. by Allbutt and Rolleston. London, 2nd ed., vol. **8**.
Oppenheim, H.* (1889), *Die Traumatischen Neurosen.* Berlin.
Osler, W.* (1894), *On Chorea and Choreiform Affections.* London.
Parsons, J. H. (1949), *Brain*, **72**, 302.
Pavlov, I. P. (1927), *Conditioned Reflexes.* London. (Trans. from the Russian by Anrep.)
Idem (1941), *Lectures on Conditioned Reflexes : Conditioned Reflexes and Psychiatry.* New York. (Trans. from the Russian by Gantt.)
Penso, G.* (1934), *Arch. ital. sci. med. col., Tripoli*, **15**, 364.
Piaget, J. (1932), *The Language and Thought of the Child.* London.
Pick, A.* (1902), *Jahrb. Psychiat. Neurol.*, **21**, 282.
*Idem** (1916), *Fortschr. Psychiat.*, **4**, 34.
Price, F. W. (1941), (Editor), *Text-book of the Practice of Medicine.* London, 6th ed.
Rado, S. (1942), *Psychosom. Med.*, **4**, 362.
Repond, A. (1940*a*), *Ann. méd.-psychol.*, **98**, 311.
Idem (1940*b*), *Schweiz. Med. Wschr.*, **70**, 148.
Revez, B.* (1911), *Arch. Schiffs. Tropenhyg.*, **15**, 20.
Ribot, Th. (1915), *Diseases of the Will.* Chicago.

RIVERS, W. H. R. (1920), *Instinct and the Unconscious.* London.
SAKAKI, Y.* (1903), *Neurologia.* Tokyo, vol. **3**.
*Idem** (1906), *Mitt. K. Jap. Univ. Tokyo,* 1903–5.
SARNELLI, T.* (1934), *Arch. ital. sci. med. col., Tripoli,* **15**, 750.
SCHEBEN, L.* (1900), *Arch. Schiffs. Tropenhyg.,* **14**, 692.
SCHEUBE, B. (1903), *Diseases of Warm Countries.* London. (Trans. by Falcke from the German.), 2nd ed., revised.
SCHNEIDER, D. E. (1938), *J. Nerv. Ment. Dis.,* **88**, 18 and 200.
SCHNEIDER, K.* (1923), *Z. ges. Neurol. Psychiat.,* **82**, 275.
SCHRENCK. L.* (1850), *Reise durch die Tundren der Samojeden.* St. Petersburg, vol. **1**.
SHIROKOGOROFF, M. (1935), *The Psychomental Complex of the Tungus.* London.
SIEKMANN, W.* (1932), *Psychol. Forschung.,* **16**, 34.
STENGEL, E. (1936), *Z. ges. Neurol. Psychiat.,* **154**, 778.
Idem (1947), *J. Ment. Sci.,* **93**, 598.
STOUT, G. F. (1938), *A Manual of Psychology.* London, 5th ed.
STRECKER, E. A., and APPEL, K. E. (1945), *Psychiatry in Modern Warfare.* New York.
STRONG, R. P. (1944), Stitt's *Diagnosis, Prevention and Treatment of Tropical Diseases.* Philadelphia, 7th ed.
SULLY, J. (1902), *An Essay on Laughter.* London.
SWETTENHAM, F. (1900), *Malay Sketches.* London.
THORNE, F. C. (1944), *Amer. J. Psychiat.,* **101**, 105.
TOURETTE, GILLES DE LA (1881), *Arch. Neurol.,* **5**, 146.
Idem (1884), *ibid.,* **8**, 65.
Idem (1885), *ibid.,* **9**, 19.
UCHIMURA, Y. (1935), *Lancet,* i, 1272.
Idem, AKIMOTO and ISHIBASHI (1938), *Amer. J. Psychiat.,* **94**, 1467. (Abstract from *Psychiat. Neurol. Jap.,* Jan., 1938.)
UEXKULL, J. VON (1926), *Theoretical Biology.* London.
WERNER, H. (1940), *Comparative Psychology of Mental Development.* New York. (Trans. from the German by Garside.)
WERTHEIM, M. (1912), *Z. Psychol.,* **61**, 61.
WILSON, S. A. KINNIER (1940), *Neurology.* London. Ed. by Bruce.
WINIARCZ, W., and WIELAWSKI, J. (1936), *Psychoanal. Rev.,* **23**, 181.
WULFFTEN-PALTHE, P. M. VAN (1936), *Text-book of Tropical Medicine.* Batavia. Ed. by de Langen and Lichtenstein.
WINSTEDT, R. (1947), *The Malays : A Cultural History.* Singapore.
YANDELL, D. W. (1881), *Brain,* **4**, 339.
YAP, P. M. (1951), *J. Ment. Sci.,* **97**, 313.

Note.—In the text whenever the date of publication of a book is of historical interest (e.g., in the evolution of the concept of hysteria) this date is given after the author's name, although the original book or edition may not have been consulted, but in this bibliography the date of such translations or of later editions as have actually been consulted follows the author's name, and the date of the original book or edition is mentioned next.

* The asterisk indicates books not personally consulted.

THE CONCENTRATION OF ADRENALINE-LIKE SUBSTANCES IN BLOOD DURING INSULIN HYPOGLYCAEMIA.

By H. Weil-Malherbe, M.D., D.Sc., and A. D. Bone,
Runwell Hospital, Wickford, Essex.

[Received 16 March, 1952.]

Since the demonstration of increased sympathetic activities during insulin hypoglycaemia by Cannon, MacIver and Bliss (1924) the assumption has been current that hypoglycaemia also increases the concentration of circulating adrenaline, and repeated attempts have been made to verify this experimentally. Brandt and Katz (1933), using the perfused rabbit ear, the isolated rabbit ileum and the enucleated frog eye as test objects, found that human blood possessed adrenaline-like activities during hypoglycaemia, while control blood was inactive. Meythaler and Wossidlo (1935) reported that the blood of subjects injected with insulin caused an increased vasoconstriction of the perfused rabbit ear and, more recently, Meythaler, Lobenhofer and Haggenmiller (1951) found that the response varied according to the constitutional type of the subject. Heilbrunn and Liebert (1939), however, observed no uniform effects when they tested the blood of patients undergoing insulin shock therapy with the frog perfusion technique ; while there was a rise of adrenaline-like activity in some patients, others showed a fall and some failed to show any definite pattern. The results of Tietz, Dornheggen and Goldman (1940) and of Tietz and Birnbaum (1942) who used Shaw's colorimetric method indicated little change in the first two hours after insulin injection, but in the later stages of hypoglycaemia there was a more consistent tendency towards an increase of concentration. The proportion of adrenaline in the chromogenic material estimated by Shaw's method increases during hypoglycaemia, according to Raab (1943). Kalaja (1942), with a fluorimetric method, also found an increase of the blood adrenaline level after insulin injection. On the other hand, Richter (quoted by Jones, 1939) who used the method of Shaw came to the conclusion that adrenaline was not present in significantly increased concentration in arterial blood during those stages of hypoglycaemia when the clinical picture suggested the possibility of adrenalinaemia.

Unfortunately, none of the methods used by previous investigators possesses that degree of specificity and sensitivity which is necessary for the estimation of adrenaline in peripheral blood. Gaddum, Peart and Vogt (1949) have recently studied the application of a series of biological tests to the estimation of adrenaline and noradrenaline in blood. Many of them were shown to be subject to interference by substances either preformed in the blood or liberated after shedding unless special precautions were taken. Even with the most sensitive of these tests it was not possible to detect adrenaline in concentrations smaller than 10 μgm./l. of plasma and noradrenaline in concentrations smaller than 100 μgm./l. of plasma. As for the chemical methods, the most sensitive one is that recently devised by Lund (1949, 1950) with which it is possible to determine adrenaline in concentrations of 10 μgm./l. and noradrenaline in concentrations of 10–20 μgm./l., yet Lund was unable to measure accurately the amounts occurring in peripheral venous blood.

The experiments of Euler and Schmiterlöw (1947) probably give the most reliable estimate of the concentration of adrenergic amines in blood. By extracting large volumes of human and bovine blood they detected some sympathomimetic activity. It was typical for *l*-noradrenaline and corresponded to a concentration of 10–20 μgm./l., with perhaps a small admixture of adrenaline amounting to not more than 4 per cent. of the total. These results, then, provide a standard for judging the adequacy of a method with which it is intended to study the level of catechol amines in blood. Such a method must not only be sensitive enough to measure concentration ranges below 10 μgm./l., but it must also be more specific than most of the earlier methods which gave estimates for the normal blood-adrenaline level far in excess of the values now considered possible.

A method which appears to satisfy both requirements has recently been developed by us (Weil-Malherbe and Bone, 1952). It is based on the formation of a stable fluorescent condensation product of adrenochrome and ethylenediamine, which is measured fluorimetrically after extraction with *iso*butanol. Adrenaline concentrations ≥ 1 µgm./l. may be determined with a standard deviation of about 5 per cent. None of the non-catechol substances tested produced appreciable fluorescence; furthermore, the precursor of the fluorescent compound completely disappeared from plasma at the same rate as added adrenaline, either by autoxidation at pH 8·4 or by treatment with amine oxidase. The method, therefore, seems to be specific for catechol amines. On the other hand, the method is unable to differentiate between adrenaline and noradrenaline. The latter substance produces a fluorescence intensity one-fifth of that of adrenaline, while the fluorescence intensity of a mixture of both substances is equal to the sum of the fluorescence produced by the separate components.

The fluorescence intensity obtained with a large number of plasma samples corresponds to a concentration of 3–4 µgm./l. of adrenaline, but a purified plasma extract did not possess the pharmacological activity that would have been expected if the reacting material had consisted entirely of adrenaline. In view of the results of Euler and Schmiterlöw and those of Fleetwood (1951) it is suggested that the substance estimated in plasma is largely *l*-noradrenaline. Pending a final identification which is at present being attempted in our laboratory, the results have been expressed in terms of adrenaline. They are made applicable to noradrenaline by multiplication by 5. A normal concentration of 15–20 µgm./l. of noradrenaline is thus obtained, a value in excellent agreement with the findings of Euler and Schmiterlöw.

For most clinical problems the proportion of the two adrenergic amines in blood is of secondary interest compared with the variation of the global value. Owing to the different fluorescence intensities of the adrenaline and noradrenaline derivatives a change of result may indicate either a change in global concentration or a shift of the adrenaline-noradrenaline ratio. However, if we accept the conclusions of Euler and Schmiterlöw as to adrenaline constituting only about 4 per cent. of the sum total of adrenergic amines in blood, even large changes of the ratio will affect the fluorescence intensity in only a small degree: thus, a 100 per cent. increase of the ratio will cause a fluorescence increase of 14 per cent. and a 100 per cent. decrease of the ratio will cause a fluorescence decrease of 7 per cent. As there is at present no means of taking changing ratios into consideration we have treated our results as if the adrenaline-noradrenaline ratio had remained constant. In the following the term "blood adrenaline" will be used for the total of adrenergic amines estimated by our method without implications as to the identity of the constituents or the composition of the mixture.

EXPERIMENTAL.

The subjects of this investigation, fifteen men and thirteen women, were patients of Runwell Hospital undergoing insulin shock therapy. They were recent admissions, aged 20–46 years. Twenty-two cases were diagnosed as schizophrenics, two as psychopaths, and four suffered from confusional psychosis of epileptic, puerperal or unknown origin. The number of experiments performed totalled seventy-nine of which thirty-nine were carried out on male and forty on female patients. In the tables of results each patient is denoted by a number so that different experiments performed on the same subject may be recognized. In the first group of experiments in which the blood adrenaline level before, during and after hypoglycaemia was determined, some subjects were deliberately chosen who were still in the preparatory stage and did not go into coma. In the others the number of the coma on the day of experiment varied from the 1st to the 63rd of the course of treatment. Insulin was injected intramuscularly in doses varying from 20–344 units.

Solutions for injection.—The solutions were of equimolar strength and contained, per 100 ml., one of the following four substances: *l*-glutamic acid, 25 gm.; L-arginine hydrochloride, 36 gm.; succinic acid, 20·1 gm.; glycine, 12·8 gm. They were adjusted to pH 7·0 with NaOH by means of a glass electrode. The solution of glutamic acid was sterilized by filtration, the other solutions by autoclaving. Doses of 10 ml. were uniformly used for the intravenous injections.

Electrical stimulation.—With the exception of Case 1, Table VII, who received classical E.C.T., all cases were treated by subconvulsive therapy as described by Montagu (1952). Currents of 1–4 ma. were applied for a standard period of five minutes.

Analytical.—Adrenaline was determined in plasma by a method which has been described elsewhere (Weil-Malherbe and Bone, 1952). Blood-sugar estimations were carried out in a limited number of cases by the method of Nelson (1944) on a sample of the venous blood withdrawn for the estimation of adrenaline. In the Nelson method it is the usual practice to carry out deproteinization by adding 0·5 ml. of 5 per cent. $ZnSO_4$ and 0·5 ml. 0·3 N-$Ba(OH)_2$ to 0·2 ml. blood and diluting to 5 ml. Owing to the low blood-sugar values in hypoglycaemic coma and to the dilution of the blood by the fluoride-thiosulphate solution in which blood is collected for the adrenaline estimation it became necessary to increase the blood volume to 0·5 ml. This modification was controlled at the outset by testing the fluoride-thiosulphate solution for interference, which proved to be *nil*, and further by testing the blood filtrate for the presence of protein, which on this occasion was absent. Later, however, we became aware of the fact that in a number of cases deproteinization was incomplete and that the reducing values obtained were too high. The fault could easily be rectified by doubling the amount of the $ZnSO_4$- and $Ba(OH)_2$-solutions, but a considerable number of blood-sugar estimations had to be rejected. All blood-sugar values reported in this paper were obtained after the modified method of deproteinization was introduced.

RESULTS.

The Effect of Hypoglycaemia.

As a rule, six blood samples were collected from each subject during an experiment as follows: sample No. 1 before insulin injection, samples Nos. 2, 3 and 4 at 30, 60 and 120 minutes after the injection, sample No. 5 during coma or, if the patient did not go into coma, shortly before the glucose feed, and sample No. 6 one hour after the termination of coma. The results are assembled in Table I. They show that insulin produces a sharp drop of the blood-adrenaline level almost immediately after the injection. In fact, the first sample, withdrawn 30 minutes after the injection, usually represents the lowest value of the curve. This steep fall is followed by a slight rise in the 60 minute sample, and from then until the termination of hypoglycaemia the values remain fairly steady on a level well below normal. One hour after the termination of hypoglycaemia the starting level of the blood-adrenaline concentration has been restored or sometimes exceeded.

These changes were found to be relatively uniform and independent of age, sex or diagnosis. They were the same whether the patients were starting or finishing their course of treatment. The first four cases of Table I were studied during the preparatory stage when subcoma doses of insulin were administered. Here hypoglycaemia in the later stages was less severe and, consequently, the lowering of the adrenaline level was less sustained, but it was as marked in the 30 minute sample as in the cases who received a full coma dose. Often the development of hypoglycaemia is delayed in those patients who have reached the stage when full coma doses are given. In such cases, as for example in No. 12, the adrenaline level may drop to its lowest value at a time when the blood sugar is still within the normal glycaemic range. Case 6 was unusual in retaining a fairly high adrenaline level during hypoglycaemia and in showing an abnormally high value in the last sample.

From the values of the means and their standard errors it is immediately obvious that the differences of the adrenaline levels before, during and after hypoglycaemia are statistically significant. It is, however, preferable to take into account the fact that each two series of samples consist of paired samples withdrawn from the same individual in a particular experiment. A measure of significance (t) may be obtained by dividing the difference of the means of two series by the standard error of the difference of paired samples. When this was done with the differences between series 1 and 2, 2 and 4, and 4 and 6 of Table I the following values were obtained for $t_{(N=13)}$: 9·53, 5·09 and 6·23, respectively, all of them corresponding to $P<0·01$. This shows that the changes of adrenaline level are highly significant not only at the beginning and at the conclusion of hypoglycaemia, but also during hypoglycaemia when the adrenaline level rises from the low value at 30 minutes to the higher value at 2 hours.

TABLE I.—*Concentration of Catechol Amines in Plasma (in Terms of Adrenaline) during Insulin Hypoglycaemia.*

No.	Sex.	Units of insulin.	No. of coma.	Adrenaline (μgm./l.).						Blood sugar (mgm.%).					
				1	2	3	4	5	6	1	2	3	4	5	6
				Before insulin.	½ hour.	1 hour.	2 hours.	During coma or before feed.	1 hour after feed.	Before insulin.	½ hour.	1 hour.	2 hours.	During coma or before feed.	1 hour after feed.
1	M.	92	—8*	3·37	2·36	2·90	2·97	2·78	3·34						
2	F.	40	—3*	4·64	2·13	2·47	2·71	2·66	3·62	94	84	59	29	27	141
3	F.	100	—2*	3·51	1·83	1·74	2·56	..	3·39						
4*a*	M.	20	—3*	3·81	2·24	2·84	3·30	3·42	4·39	73·5	18·5	29	27	32	226
4*b*	..	80	2	3·73	2·39	2·76	2·62	2·67	3·44	84·5	29·0	6·2	4·7	1·6	92·5
5	M.	125	44	3·62	2·54	2·86	2·81	2·96	4·22						
6	M.	92	4	3·77	3·49	3·02	3·35	3·34	6·32						
7	M.	92	8	3·50	2·40	2·83	2·70	..	3·92						
8	M.	192	21	3·42	2·18	2·37	2·44	2·49	3·04						
9	M.	216	14	4·18	2·40	2·54	2·70	2·84	3·76	86	16	4	4	3·4	47·5
10	M.	328	6	3·52	2·11	..	2·63	2·64	3·58	101	78	46	8	13·5	55
11	F.	60	13	3·57	2·28	2·68	2·82	3·06	3·70						
12	F.	52	14	3·78	1·95	2·23	2·16	2·55	3·04	130	102	28·5	6·6	10·4	179
	Mean			3·72	2·33	2·60	2·75	2·85	3·83						
	Standard error			0·096	0·111	0·104	0·089	0·093	0·230						

* Number of treatment preceding first coma.

The Effect of Glutamic Acid and Related Compounds in Hypoglycaemic Coma.

It has previously been suggested (Weil-Malherbe, 1949) that the effect of glutamic acid in terminating hypoglycaemic coma is due to adrenergic stimulation. This conclusion was supported by the observation that erythrocyte lysates had a stronger adrenergic effect on rabbit intestine after than before the injection of glutamic acid. Owing to the low specificity of biological tests the evidence was not conclusive. It has now been possible to confirm the earlier results and to put them on a quantitative basis.

The experiments were carried out on patients who had been in coma for at least 30 minutes and had, on previous occasions, shown no tendency to spontaneously regaining consciousness. Four blood samples were collected: at 10 minutes and immediately before, and at 5 and 10 minutes after the injection.

An increase of the plasma adrenaline level after the intravenous injection of glutamic acid was observed in every case, whether consciousness returned or not (Table II). A comparison of the adrenaline figures observed at 5 and 10 minutes after the injection, however, suggests that the effect was more sustained in those patients who roused than in those who remained comatose. From this it seems as if the duration of the effect was of greater importance than its intensity.

If the effect of glutamic acid in hypoglycaemic coma is due to an adrenergic mechanism rather than to its specialized metabolic functions (cf. Weil-Malherbe, 1950, 1952) it may be expected to be comparatively unspecific. The activity of glycine and of *p*-aminobenzoic acid has already been demonstrated by Mayer-Gross and Walker (1949) who, however, found succinic acid to be inactive. Weil-Malherbe (1949) found that a protein hydrolysate possessed weak activity. By studying the effect of different compounds in equimolar doses on blood adrenaline levels it should be possible not only to obtain a quantitative measure of their adrenergic activity, but also to decide whether a correlation exists between adrenergic activity and the restoration of consciousness. The substances studied in this way were: L-arginine, as a representative of basic amino-acids, glycine, as a representative of neutral amino-acids, and succinic acid, as a non-amino-acid closely related to glutamic acid.

The results are presented in Tables III–V. Arginine was found to be almost as active as glutamic acid, in its effect on adrenaline levels as well as in its effect on consciousness. On the whole, the effect on blood-adrenaline concentration was smaller in those cases which remained comatose than in those which responded. The effect of glycine was much weaker. Only one case was fully roused, and this happened to be the case showing the highest rise of the adrenaline level. With succinic acid the effect was weaker still, though not entirely absent. Again, the two cases in which coma was relieved also showed the most pronounced increase of adrenaline concentration.

It is noteworthy that in the four series of experiments to which the data in Tables II–V refer, the variation between the first and second sample within each experiment is usually very small. Moreover, the variation between different experiments is also small as shown by the low standard error and by the fact that the means of the eight pre-injection series do not show any significant differences. The post-injection samples (series Nos. 3 and 4), on the other hand, show a higher degree of dispersion, not only within the same individuals, but also between different individuals, as indicated by the increase of the standard error. This presumably is an expression of real differences in the response to the injections.

For a statistical evaluation of the injection effects the mean of the two pre-injection samples was subtracted from the mean of the two post-injection samples for each individual. The mean of the differences, divided by its standard error, was used as a measure of significance (t). The following results were obtained: for glutamate $t_{(N=10)} = 7\cdot73$, for arginine $t_{(N=11)} = 5\cdot84$, for glycine $t_{(N=11)} = 3\cdot71$, and for succinate $t_{(N-11)} = 3\cdot32$. All these values indicate a high degree of significance ($P<0\cdot01$) showing the reality of the adrenergic effect even in the case of succinate. At the same time the gradation of the t-values suggests significant differences in the adrenergic activities of the four substances. This point was further tested by an analysis of variance of the differences between pre- and post-injection samples obtained in the four experiments. The result (Table VI) confirmed the fact that the actions of the four substances differ significantly in their effect on blood-adrenaline levels.

TABLE II.—*Effects of Intravenous Injecton of l-Glutamic Acid during Hypoglycaemic Coma.*

No.	Sex.	Adrenaline (μgm./l.).				Blood sugar (mgm. %).				Restoration of consciousness.*
		1 10 min. before injection.	2 Immediately before injection.	3 5 min. after injection.	4 10 min. after injection.	1 10 min. before injection.	2 Immediately before injection.	3 5 min. after injection.	4 10 min. after injection.	
3	F.	2·68	2·48	3·42	3·32	..	..	..	..	+
7	M.	2·26	2·08	2·92	3·20	..	..	..	..	+
12	F.	2·76	2·78	3·76	3·42	12·7	17·0	38·0	31·0	—
13	M.	2·34	2·31	3·48	4·78	..	..	..	..	+
14	M.	2·72	2·65	3·90	3·44	..	..	..	..	(+)
15	M.	2·54	2·62	4·52	4·07	0·6	1·3	20·5	20·0	—
16	F.	3·29	3·14	3·84	3·90	..	..	..	..	+
17	F.	2·84	2·96	3·84	3·88	6·4	9·2	24·0	35·2	(+)
18*a*	F.	2·80	2·64	5·04	4·05	..	..	..	..	(+)
18*b*	..	2·97	2·94	3·93	3·68	..	..	..	..	+
Mean	.	2·72	2·66	3·86	3·77					
Standard error		0·094	0·100	0·184	0·145					

* + = Fully aroused.
(+) = Awake, but unable to swallow.
— = Remaining in coma.

TABLE III.—*Effects of Intravenous Injection of l-Arginine during Hypoglycaemic Coma.*

No.	Sex.	Adrenaline (μgm./l.). 1 10 min. before injection.	Adrenaline (μgm./l.). 2 Immediately before injection.	Adrenaline (μgm./l.). 3 5 min. after injection.	Adrenaline (μgm./l.). 4 10 min. after injection.	Blood sugar (mgm. %). 1 10 min. before injection.	Blood sugar (mgm. %). 2 Immediately before injection.	Blood sugar (mgm. %). 3 5 min. after injection.	Blood sugar (mgm. %). 4 10 min. after injection.	Restoration of consciousness.*
2	F.	2·64	2·68	3·10	3·52	8·0	7·8	32·5	36·4	(+)
8	M.	2·56	2·64	3·83	3·23	4·8	5·3	13·6	16·4	(+)
10	M.	2·64	2·69	3·22	4·02	8·9	10·3	17·6	18·2	+
12	F.	2·68	2·61	3·18	3·96	..	..	..	..	(+)
17	F.	2·77	2·70	4·30	3·72	..	..	..	..	+
19	M.	2·87	2·96	3·02	3·48	..	..	..	..	–
20	M.	2·74	2·77	3·24	3·87	9·6	12·8	29·0	26·6	+
21*a*	M.	2·72	3·10	3·70	4·20	10·9	11·1	18·9	13·3	(+)
21*b*	..	2·65	2·63	2·95	2·89	0·7	0·7	5·3	1·4	–
22	F.	2·64	2·66	4·62	4·82	..	..	..	..	+
23	F	2·79	2·83	2·99	3·53	5·5	4·7	21·7	14·9	–
Mean		2·70	2·75	3·47	3·75					
Standard error		0·026	0·047	0·171	0·156					

* Notation as in Table II.

TABLE IV.—*Effects of Intravenous Injection of Glycine during Hypoglycaemic Coma.*

No.	Sex.	Adrenaline (μgm./l.). 1 10 min. before injection.	Adrenaline (μgm./l.). 2 Immediately before injection.	Adrenaline (μgm./l.). 3 5 min. after injection.	Adrenaline (μgm./l.). 4 10 min. after injection.	Blood sugar (mgm. %). 1 10 min. before injection.	Blood sugar (mgm. %). 2 Immediately before injection.	Blood sugar (mgm. %). 3 5 min. after injection.	Blood sugar (mgm. %). 4 10 min. after injection.	Restoration of consciousness.*
8	M.	2·61	2·62	3·42	3·21	8·2	12·3	20·6	20·0	—
12	F.	2·62	2·68	2·78	2·26	..	..	..	..	—
15	M.	3·02	2·85	3·07	3·75	8·5	12·2	21·5	14·6	(+)
19	M.	2·94	2·82	2·80	3·02	..	..	..	..	—
20	M.	3·03	3·06	4·74	3·98	..	..	..	..	+
21*a*	M.	2·87	2·96	3·02	3·48	..	..	..	..	—
21*b*	..	2·63	2·64	3·50	2·67	8·7	13·2	15·2	13·9	—
21*c*	..	2·72	2·69	2·86	3·04	2·6	3·3	2·6	8·7	—
22	F.	2·64	2·70	2·62	3·14	..	..	..	..	—
23	F.	2·87	2·90	3·48	4·00	4·3	5·0	9·6	15·5	—
24	F.	2·88	2·97	3·58	3·24	14·3	14·2	15·7	17·0	—
Mean		2·80	2·81	3·26	3·25					
Standard error		0·049	0·046	0·179	0·160					

* Notation as in Table II.

TABLE V.—*Effects of Intravenous Injection of Succinic Acid during Hypoglycaemic Coma.*

No.	Sex.	Adrenaline (μgm./l.).				Blood sugar (mgm. %).				Restoration of consciousness.*
		1 10 min. before injection.	2 Immediately before injection.	3 5 min. after injection.	4 10 min. after injection.	1 10 min. before injection.	2 Immediately before injection.	3 5 min. after injection.	4 10 min. after injection.	
8	M.	2·67	2·59	2·98	2·82	6·7	6·7	7·9	7·3	—
10	M.	2·58	2·57	3·94	3·78	7·4	6·8	27·0	40·5	+
12*a*	F.	2·48	2·61	3·09	2·75	..	..	..	..	—
12*b*	F.	2·62	2·60	3·11	2·90	..	..	..	..	—
17	F.	2·58	2·18	2·81	2·72	..	..	..	..	—
18	F.	2·76	2·66	2·86	4·00	..	..	..	..	(+)
19	M.	2·75	2·81	3·44	2·85	..	..	..	..	—
20	M.	2·95	3·00	2·98	2·98	..	..	..	..	—
21	M.	2·75	2·72	3·02	3·10	..	..	..	..	—
22*a*	F.	2·72	2·73	2·88	2·49	..	..	..	..	—
22*b*	..	2·96	2·92	2·80	3·19	16·6	17·0	23·2	21·9	—
Mean		2·71	2·67	3·08	3·05					
Standard error		0·045	0·071	0·101	0·138					

* Notation as in Table II.

TABLE VI.—*Analysis of Variance of the Increases in Blood-Adrenaline Concentration Produced by the Injection of Four Substances.*

	Degrees of freedom.	Sum of squares.	Mean square.	Standard deviation.	x.	P.
Between groups	3	4·0908	1·3636	1·1678	0·7657	$<0{\cdot}01$
Within groups	39	11·4789	0·2943	0·5425		

Similarly, the effects on consciousness were compared by a χ^2-test. A 2 × 4 table was set up in which, for each of the four substances, results symbolized by + and (+), were combined and contrasted with negative results. It was found that $\chi^2{(N=3)} = 14{\cdot}64$, corresponding to $P<0{\cdot}01$ and indicating highly significant differences in the effects of the four substances.

The blood-sugar rise following the injection of glutamate during hypoglycaemic coma has previously been sufficiently demonstrated (Mayer-Gross and Walker, 1949; Weil-Malherbe, 1949). Blood-sugar estimations were carried out in a number of instances, especially in the experiments of Tables III–V. The results are not as full as we would have wished owing to the complication already mentioned (cf. analytical section). In most cases for which blood-sugar values are available the correlation with the adrenaline figures is satisfactory.

The Effect of Electric Currents in Hypoglycaemic Coma.

It has been found (unpublished experiments) that the conduction of electric currents through the brain of normoglycaemic patients leads to a rise of the blood-adrenaline concentration, whether convulsions occur or not. If a correlation exists between adrenergic stimulation and the restoration of consciousness in hypoglycaemic coma, the effect of electrical treatment might be expected to be similar to that of glutamic acid injections. It could be shown, in collaboration with Dr. J. D. Montagu, that this is indeed the case.

For these experiments five blood samples were usually collected from each subject: two before the application of current (with an interval of 10 minutes), one during the application (about 3 minutes after switching on), and two after the treatment (at 1 and 10 minutes after switching off). As shown in Table VII, blood adrenaline is highest in the sample withdrawn during the application of the current. One minute after the treatment there is usually a perceptible fall, and after 10 minutes the effect has in many cases almost disappeared.

Electrical stimulation was not equally effective in every case. Failures may have been due to the current being by-passed through the skin, owing to excessive sweating, or to respiratory spasms which prevented the application of a sufficiently high current intensity. In Case 17*c*, Table VII, the current could be stepped up to 4·5 ma., but the increase of the blood-adrenaline concentration was not sustained. Similar observations were made in other cases which remained in coma and the brief duration of the adrenergic effect may well account for the lack of clinical response in these cases. The same patient who could not be roused by a current of 4·5 ma. was dramatically awakened by an injection of arginine (Table III, Case 17), and it will be noticed that in this experiment the increased level of blood adrenaline still persisted after 10 minutes. On the whole, the data of Table VII show that the correlation between adrenergic stimulation and relief of coma is good. A similar correlation was found between blood-sugar rise and relief of coma (Montagu, 1952).

In the last ten experiments of Table VII each patient was investigated twice, first with the electrodes in the standard position on opposite sides of the skull and again, on a subsequent day, with both electrodes placed on the same side of the head, the strength of current and the time of application being identical on both occasions. It is apparent that with the latter arrangement in which the main current did not pass through the brain no effect on either the blood-adrenaline level or the comatose state was observed, while both effects were present when the same current was conducted across the brain. It may be concluded that the effect of the current going through the brain is not due to a stimulation of cutaneous pain receptors.

Statistical examination by the method of paired variables showed that the increase of the blood-adrenaline concentration occurring during the application of current is highly significant ($t_{(N=16)} = 5{\cdot}9$), as is also the decrease occurring after the current has been discontinued ($t_{(N=16)} = 4{\cdot}7$).

TABLE VII.—*Effects of Electrical Brain Stimulation during Hypoglycaemic Coma.*

No.	Sex.	Type of treatment (1)	Placement of electrodes. (2)	Adrenaline (μgm./l.). 1 10 min. before treatment.	2 Immediately before treatment.	3 During treatment (3 min.).	4 1 min. after treatment.	5 10 min. after treatment.	Restoration of consciousness. (3)
1	M.	ECT	T	2·08	2·03	. .	3·09	2·79	—
7*a*	M.	ESCT	T	2·58	2·68	3·48	2·96	2·63	(+)
7*b*	—	ESCT	T	2·81	2·70	5·00	4·31	3·34	(+)
14*a*	M.	ESCT	T	2·49	2·42	3·56	. .	2·46	—
14*b*	. .	ESCT	T	2·66	2·52	4·35	3·06	3·22	—
15*a*	M.	ESCT	T	2·74	2·55	3·63	4·25	3·06	—
15*b*	. .	ESCT	T	2·66	2·68	4·31	3·85	3·01	—
25	M.	ESCT	T	2·58	2·54	3·38	3·08	2·64	(+)
26	F.	ESCT	T	2·82	2·78	3·27	3·78	3·80	(+)
17*a*	F.	ESCT	T	2·81	2·66	3·56	2·82	2·56	—
17*b*	. .	ESCT	T	2·74	2·72	4·88	4·50	3·06	—
17*c*	. .	ESCT	T	2·68	2·65	4·50	3·70	2·99	—
12*a*	F.	ESCT	T	2·62	2·62	7·95	3·10	2·96	(+)
12*b*	. .	ESCT	U	2·72	2·73	3·05	2·82	2·82	—
18*a*	F.	ESCT	T	3·02	2·96	4·97	3·98	3·43	(+)
18*b*	. .	ESCT	U	2·75	2·55	2·68	2·74	2·60	—
23*a*	F.	ESCT	T	2·61	2·62	3·78	4·22	3·60	+
23*b*	. .	ESCT	U	2·74	2·73	2·88	2·80	2·85	—
27*a*	F.	ESCT	T	2·68	2·60	4·15	4·36	4·18	+
27*b*	. .	ESCT	U	2·68	2·68	2·84	2·72	2·88	—
28*a*	F.	ESCT	T	2·77	2·78	4·50	3·34	. .	+
28*b*	. .	ESCT	U	2·70	2·71	2·68	1·93	1·99	—
Mean (ESCT only)			T	2·70	2·66	4·33	3·68	3·13	
Standard error				0·035	0·031	0·282	0·150	0·124	
Mean			U	2·72	2·68	2·82	2·60	2·63	
Standard error				0·013	0·038	0·069	0·169	0·167	

(1) ECT = electrical convulsion therapy (Cerletti-Bini).
ESCT = electrical subconvulsive therapy.
(2) T = transcerebral, electrodes on opposite sides of skull.
U = unilateral, electrodes on same side of skull.
(3) Notation as in Table II.

DISCUSSION.

The lowering of the blood-adrenaline level in insulin hypoglycaemia is difficult to reconcile with many well-established observations. The stimulation of the sympathetic system during hypoglycaemia has been studied particularly by Gellhorn (1943, 1949) and Himwich (1951). It is attributed to the recession of cortical dominance leading to increased activity of subcortical autonomic centres. Such a mechanism might be expected to entail increased discharges of adrenergic amines from the adrenal medulla and from postganglionic sympathetic nerve endings elsewhere. Various authors have described a sympathetic stimulation of denervated structures, such as increased heart rate (Cannon *et al.*, 1924), constriction of cutaneous blood vessels (Freeman, Smithwick and White, 1934), contraction of the nictitating membrane (Partington, 1936), and dilatation of the pupil (Abe, 1924 ; Bender and Siegal, 1939), effects which are presumably of hormonal origin. Evidence has further been obtained, both by histological methods (Poll, 1925 ; Ricci and Milani, 1925 ; Hofmann, 1926 ; Kahn, 1926) and by the analysis of extracts (Saito, 1929 ; Burn, Hutcheon and Parker, 1950 ; West, 1951 ; Outschoorn, 1951), that insulin hypoglycaemia is followed by a gradual depletion of the adrenaline and noradrenaline stores in the adrenal medulla. An increase of adrenaline concentration in the blood of the suprarenal vein during insulin hypoglycaemia has been demonstrated by LaBarre and Houssa (1932) and Yen, Aomura and Inaba (1933). The fall of the adrenaline content in the adrenal medulla is therefore not due to an inhibition of adrenaline synthesis, but to an increase of adrenaline secretion which, according to the Japanese authors, is ten times higher than the normal rate.

The discrepancy between the observations indicating a fall of the adrenaline concentration in venous blood and those indicating a higher rate of discharge during hypoglycaemia might be explained by various *ad hoc* hypotheses, but without further evidence their discussion does not seem profitable. The most obvious possibility, an increased rate of utilization of adrenergic amines by peripheral tissues, will have to be investigated by the estimation of arteriovenous differences. It will also be necessary to study the effect of insulin when hypoglycaemia is prevented by simultaneous glucose administration.

Meanwhile attention may be directed to a few points which should be considered in this connection. (1) Much of the evidence concerning the increased discharge of adrenaline during hypoglycaemia has been obtained one hour or more after the administration of insulin. We have found that the initial fall of plasma adrenaline is completed within one half hour and that afterwards there is a slight rise. Symptoms of sympathetic stimulation may be connected with this phase. (2) One possibility can be excluded as a reason for the low values of the blood adrenaline, *viz.*, an exhaustion of the productive capacity of the cells synthesizing adrenergic amines. This is shown by the prompt response of the blood-adrenaline level to electrical stimulation and to the injection of amino-acids. In the case of electrical stimulation at least, the adrenaline response is no peculiarity of the hypoglycaemic state ; it may be safely assumed that it is due to an increased discharge of adrenergic amines rather than to changes in the rate of their peripheral utilization. The rise of the adrenaline level in blood, whether produced by electrical stimulation or by the injection of amino-acids, is usually followed by a rise of the blood-sugar level. Since noradrenaline has a much smaller hyperglycaemic and glycogenolytic effect than adrenaline (McChesney, McAuliff and Blumberg, 1949 ; Schümann, 1949 ; Lundholm, 1950 ; Sutherland and Cori, 1951) it may be assumed that adrenaline participates in the rise of adrenergic amines in blood.

The intravenous injection of equimolar amounts gave very different results with the four substances employed, but the sequence of their activity is the same, whether the mean rise of the blood-adrenaline level or the frequency of the termination of coma is taken as the criterion. Glutamic acid and arginine proved much more effective than glycine, a result which is in agreement with the view previously expressed (Weil-Malherbe, 1949) that the effect of glutamic acid is unspecific, but that, on the other hand, not all amino-acids are equally effective. Succinic acid appeared to be almost as active as glycine. This result which is at variance with that of Mayer-Gross and Walker (1949) shows that the effect is not necessarily confined to amino-acids. The injection of succinic acid often produces a violent erythema of the face and neck and is thus not without influence on the autonomic system.

The correlation between the rise of the blood-adrenaline concentration and the restoration of consciousness is as good as can be expected. In no case was an effect on consciousness observed without a concomitant rise of blood adrenaline. This is especially obvious in those experiments in which glycine or succinic acid were injected. On the other hand, some cases showed a significant rise of blood adrenaline without an apparent relief of coma, but in these the rise of blood adrenaline was usually poorly sustained. If we add to this the individual differences of threshold sensitivity we may conclude that the few exceptions are satisfactorily explained. We consider that the adrenergic mechanism of the glutamic acid effect in hypoglycaemia has now been proved beyond any reasonable doubt.

SUMMARY.

A recently developed fluorimetric method has been applied to the estimation of catechol amines in the venous blood of patients undergoing insulin shock therapy. While the method appears to be specific for adrenaline and noradrenaline, it does not differentiate between them, and the term " blood adrenaline " has been used in this paper to signify the total of adrenergic amines estimated. The following results were obtained :

1. The intramuscular injection of insulin produces a pronounced fall of the adrenaline level in venous blood. The lowest value is usually reached within half an hour of the injection. Thereafter a slight rise is observed, although the level remains well below normal throughout the hypoglycaemic phase. One hour after the termination of hypoglycaemia the initial adrenaline concentration has been restored or exceeded.
2. Equimolar solutions of the following four substances were injected intravenously during hypoglycaemic coma : L-glutamate, L-arginine, glycine and succinate, and their effects on the concentration of adrenaline and glucose in blood and on the comatose state of the patient were studied. All four substances induced a significant rise of the blood adrenaline level though in different degrees. While glutamate and arginine possessed high adrenergic activity, that of glycine was slight, and that of succinate weaker still. The capacity of causing arousal from coma varied in the same order.
3. Electrical stimulation of the brain by a subconvulsive technique, during hypoglycaemic coma, likewise led to a pronounced increase of the blood-adrenaline concentration and, in some cases, lifted the coma. Neither of these effects was observed when the same current was applied with both electrodes placed on one side of the skull.
4. On the whole, the correlation between the rise of the blood-adrenaline level and the relief of coma in individual cases was good. No case was observed where consciousness was restored without a marked rise of the blood-adrenaline level. On the other hand, some cases showed a rise of the blood-adrenaline level without a significant change of their comatose state. The figures suggest that in most of these cases the rise of the adrenaline level was not sufficiently sustained. As far as results are available, a similar correlation exists between blood-adrenaline rise and blood-sugar rise.
5. In the discussion attention is drawn to the discrepancy between the fall of the blood adrenaline and many well-established observations indicating an increased rate of discharge of adrenergic amines during hypoglycaemia. With regard to the effect of glutamic acid in hypoglycaemic coma the view is expressed that the evidence for an adrenergic mechanism may now be regarded as conclusive.

We wish to thank the staff of the insulin wards at Runwell Hospital for their co-operation, and Dr. R. Ström-Olsen, Physician-Superintendent, for his interest and encouragement.

REFERENCES.

ABE, Y., *Arch. exp. Path. Pharmak.*, 1924, **103**, 73.
BENDER, M. B., and SIEGAL, S., *Am. J. Physiol.*, 1939, **128**, 324.
BRANDT, F., and KATZ, G., *Ztschr. klin. Med.*, 1933, **123**, 23.
BURN, J. H., HUTCHEON, D. E., and PARKER, R. H. O., *Brit. J. Pharmacol.*, 1950, **5**, 417.
CANNON, W. B., MCIVER, M. A., and BLISS, S. W., *Am. J. Physiol.*, 1924, **69**, 46.
EULER, U. S. von, and SCHMITERLÖW, C. G., *Acta physiol. scand.*, 1947, **13**, 1.
FLEETWOOD, M. F., *Am. J. Physiol.*, 1951, **166**, 314.

Freeman, N. E., Smithwick, R. H., and White, J. C., *Am. J. Physiol.*, 1934, **107**, 529.
Gaddum, J. H., Peart, W. S., and Vogt, M., *J. Physiol.*, 1949, **108**, 467.
Gellhorn, E., *Autonomic Regulations.* New York, 1943 : Interscience Publishers, Inc.
Idem, Proc. Roy. Soc. Med., 1949, **42**, Suppl. 55.
Heilbrunn, G., and Liebert, E., *Endocrinology*, 1939, **25**, 354.
Himwich, H. E., *Brain Metabolism and Cerebral Disorders*, Baltimore, 1951 : The Williams and Wilkins Company.
Hofmann, E., *Krankheitsforsch.*, 1926, **2**, 295.
Jones, M. S., *Proc. Roy. Soc. Med.*, 1939, **32**, 958.
Kahn, R. H., *Pflügers Arch. ges. Physiol.*, 1926, **212**, 54.
Kalaja, L., *Nord. Med.*, 1942, **14**, 1101.
LaBarre, J., and Houssa, P., *C.R. Soc. Biol.*, 1932, **109**, 967.
Lund, A., *Acta pharmacol.*, 1949, **5**, 231.
Idem, ibid., 1950, **6**, 137.
Lundholm, L., *Acta physiol. scand.*, 1950, **21**, 195.
McChesney, E. W., McAuliff, J. P., and Blumberg, H., *Proc. Soc. Exp. Biol. Med.*, 1949, **71**, 220.
Mayer-Gross, W., and Walker, J. W., *Biochem. J.*, 1949, **44**, 92.
Meythaler, F., and Wossidlo, K., *Arch. exp. Path. Pharmakol.*, 1935, **178**, 320.
Idem, Lobenhofer, G., and Haggenmiller, W., *Deut. Arch. klin. Med.*, 1951, **198**, 305.
Montagu, J. D., 1952, in preparation.
Nelson, N., *J. biol. Chem.*, 1944, **153**, 375.
Outschoorn, A. S., *Nature, Lond.*, 1951, **167**, 722.
Partington, P. P., *Am. J. Physiol.*, 1936, **117**, 55.
Poll, H., *Anat. Anz.*, 1925, **60**, Erg. H.
Raab, W., *Biochem. J.*, 1943, **37**, 470.
Ricci, F., and Milani, A., *Boll. soc. med.-chir. Pavia*, 1925, 927.
Saito, S., *Tohoku J. exp. Med.*, 1929, **12**, 263.
Schümann, H. J., *Arch. exp. Path. Pharmakol.*, 1949, **206**, 164.
Sutherland, E. W., and Cori, C. F., *J. biol. Chem.* 1951, **188** 531.
Tietz, E. B., and Birnbaum, S. M., *Am. J. Psychiat.*, 1942, **99**, 75.
Idem, Dornheggen, H., and Goldman, D., *Endocrinology*, 1940, **26**, 641.
Weil-Malherbe, H., *J. Ment. Sci.*, 1949, **95**, 930.
Idem, Physiol. Rev., 1950, **30**, 549.
Idem, Biochem. Soc. Symposia, 1951. **8**, 16.
Idem and Bone, A. D., *Biochem. J.*, 1952. **51**, 311.
West, G. B., *Brit. J. Pharmacol.*, 1951, **6**, 289.
Yen, T.-J., Aomura, T., and Inaba, T., *Tohoku J. exp. Med.*, 1933, **21**, 542.

THE ECOLOGY OF MENTAL DISEASE.*

A Dissertation on the Influence of Environmental Factors in the Distribution, Development and Variation of Mental Disease.

By E. H. Hare, M.A., M.D.Camb., D.P.M.

Barrow Hospital, Barrow Gurney, nr. Bristol.

Section A.

The Concept of Ecology.

The word "oecology" was coined by Haeckel in 1869, and the study of the complex interactions between organisms and their environment led to fruitful results first in botany (at the beginning of the twentieth century) and later in zoology. In 1935 Bews formulated the principles of human ecology, but the precise boundaries of this discipline (as Banks (1905*a*) calls it, since it cannot be called a science) are still not the subject of any general agreement. Its dictionary definition as "that branch of biology which deals with the relations of human beings to their surroundings, their habits and modes of life," although simple for the purposes of formulation, is probably too diffuse in practice. On the other hand, Miller (1950), in suggesting that the ecological study of disorders should be confined to their distribution in the purely demographic sense, seems unduly to restrict its application. There is a tendency among American ecologists (who have been the pioneers of this subject) to take a middle course. Park (1936) conceives of human ecology as the study of the community in terms of the *competitive* forces which mould it, as opposed to the *cultural* forces which make for social co-operation. Similarly, Faris (1944) distinguishes the *ecological order*, which arises automatically and unintentionally out of the struggle for survival, from the *cultural order*, which is based on mutual affection and sentiment.

The ecology of mental disease is a natural branch of human ecology, but as it has not so far been the subject of any comprehensive survey its field has yet to be delimited. For the purpose of the present thesis, a definition is adopted from that given by Elton (1950) of animal ecology, and which is in conformity with current American usage: the ecology of mental disorder is an attempt to reduce and co-ordinate into some scientific scheme the information on the varieties, distribution and social circumstances associated with mental illness, with a view to solving some of the urgent problems which are the result of man's becoming civilized and interfering with his own long-established modes of behaviour. This definition includes a basic assumption that mental illness is to some extent a disease of civilization; and its ecology is an attempt to answer the questions, how much of mental disease is caused by the conditions of civilization, and what particular factors are most responsible for causing it? It is upon the answers to these two questions that the programme of social psychiatry—the prevention and treatment of mental disease by social measures—must be based.

Section B.

A Historical Survey of the Ecological Approach to Mental Disease.

A Hippocratic aphorism (Book Two, No. 34) holds that when a person is threatened with disease by the hereditary predisposition of his family, his constitution should be changed by appropriate education and environment. Although the passing of millenia did not dim the wisdom of this advice, there could be no real knowledge of just what education and environment would offset particular predispositions until precise studies were made upon the effect of different environments on the development of disease. The census of populations, first made in

---

* Awarded the Bronze Medal of the Royal Medico-Psychological Association, 1952.

European countries toward the end of the eighteenth century, provided the opportunity and the stimulus for such studies.

During the first part of the ninteenth century, several statistical investigations were made on the distribution of insanity in the British Isles. Their present interest, however, lies less in their results that in the way they illustrate the pitfalls of the statistical method and the distorting influence of long-established prejudice. Prichard (1835), for example, finding that there were more insane persons in agricultural than in urban areas, concluded that the development of insanity " is favoured by some of the circumstances connected with agriculturalists "; he failed to take into account the relative sizes of the total populations in the different areas. The same mistake was made by Stark (1851, 1852). He showed that there were more insane people among the lower than among the middle and upper classes, and concluded that Esquirol was wrong in attributing insanity to the stress of civilization because, on that theory, there should be more insane among the more civilized (that was, the upper) classes. His statistics also showed that there was a greater prevalence of insanity in England and Scotland than in Ireland " or most other countries of the globe," and he found a satisfactory explanation for this in the prevalence of the intermarriage of blood relations. For, he says, it is a known fact that the children of such marriages are not only " much more delicate and liable to scrofulous and brain diseases " than other children, but are also " much more frequently born idiotic, blind, deaf and dumb." The similar opinion of Prichard led that great alienist to conclude that " the numbers of deranged persons in the community might be very much lessened if it were possible to regulate or establish any surveillance over the marriages of the lower orders."

Greater statistical accuracy and a growing awareness of the difficulties of drawing conclusions from statistical data mark the writings of the second half of the nineteenth century. In their *Manual of Psychological Medicine*, Bucknill and Tuke (1874) note once more the unequal incidence of insanity in various European countries, but they do not venture on an explanation. In observing that the insanity *rate* is greater in urban than in rural areas, however, they suggest physical exhaustion, bad housing, intemperate living and the want of proper relaxation as the causes; but they do not offer any objective evidence to support their conclusions. A few years later, Tuke (1878) published his *Insanity in Ancient and Modern Life*. In answer to the question " whether insanity is more common now than formerly," he concludes that it is commonest in those ages when a high degree of civilization obtains, and hence that civilization is a cause of insanity because " superior organisms have to pay for their greater sensitiveness." He points out the errors of earlier writers in supposing that the proportion of the insane is greater in the working than in the leisured classes or among rural than among urban communities, and he also questions whether the marriage of close relatives is really a major cause of insanity. Nevertheless, his conclusions are for the most part based on clinical impression rather than on statistics; and when we read (page 195) the author's severe disapproval of the fact that " in our day there is a great tendency to spoil children from their earliest years, to grant them everything they wish and to gratify them in every self-indulgence," we cannot altogether escape the feeling that Tuke, like Tacitus before him, is at times less concerned with scientific accuracy than with moral exhortation.

The opening decades of the twentieth century reveal a further advance towards objectivity and impartiality in the social study of mental disease. White (1903), from a study of American census returns, showed that the incidence of insanity was maximum in Massachusetts and decreased uniformly in every direction therefrom. As this distribution was also that of population density and was not that of such climatic factors as temperature, altitude or precipitation, he concluded that climate was not an important cause of insanity, but suggested that mental stress was. He supported his thesis by quoting Morselli's figures for suicide in Europe, showing a maximum incidence in urban areas; and by the fact that insanity among American negroes was highest in regions of high population density although the actual population of negroes was less there than in other regions. His general conclusion was one that had now become widely accepted: insanity is due to the stress of social competition acting upon those who are so predisposed.

The nature of the predisposition, however, remained to be investigated. White himself, in common with most of his contemporaries and the alienists of the previous century, believed heredity to be the all-important factor. This age-old belief received the apparent support of statistics in a work by Heron (1907), whose figures led him to the conclusion that " the insane diathesis is inherited with as high an intensity as any physical or mental characteristics of man so far examined." But already a new view, that the environment might play a significant part in predisposing a person to later breakdown under stress, was emerging. Freud's work suggested the importance of psychological trauma in childhood as a factor in the development of neurosis, while statistical evidence for the new view was brought in a short paper by MacDermott (1908). MacDermott studied the incidence of insanity in different areas of England over a number of years, arguing that if heredity was the dominant factor in causing the insane diathesis, then it would tend to produce a constant incidence in a stable population both in space and time. His figures, however, demonstrated that the incidence of insanity increased more rapidly in some areas than in others, while in some areas it remained stationary or decreased ; and he concluded that the insane diathesis arises from the circumstances of the environment rather than ancestral inheritance.

By the time of the first World War, the importance of environmental factors both in precipitating and in disposing towards mental disorder was well established, and the investigations which had led to its recognition began to bear fruit in a practical programme of preventive psychiatry. The first Child Guidance Clinic in England was opened in 1927 ; in 1916 the American National Committee for Mental Hygiene was formed. Growing appreciation of the fact that minor degrees of mental maladjustment were exceedingly common and responsible for much unhappiness and inefficiency led to the conception of " positive mental health," so that in 1933 Meyer could define mental hygiene as " an intimate study and education of those factors which make for mental health in a positive, creative and not merely passive or mending way."

Yet it is still not established which, of many possible factors in the environment, are most important in causing mental disease. The following section presents some of the recent ecological evidence bearing on the problem and in Section D this evidence will be discussed and evaluated.

SECTION C.

ECOLOGICAL FACTORS IN MENTAL DISEASE.

Introduction.

In considering the causes of illness, it has been traditional and is still satisfactory to separate those due to heredity from those due to the environment. The present discussion is concerned with the latter, but certain observations may appropriately be made upon the relation of genetics with mental disease.

Many writers (for example, Kallmann, 1948) have attempted to show that certain types of mental disease are inherited according to formal (although complex) Mendelian principles. If this were true, then the ecological factors would probably be of less importance and the prospect of success for any scheme of preventive psychiatry considerably poorer than if it were false. It is therefore appropriate to point out that these genetic theories have recently been the subject of criticism (Gerard and Siegel, 1950 ; Shulman, 1950), principally on the grounds that the diseases themselves are ill-defined and that the studies ignore the importance of the cultural environment in forming even the most basic patterns of reaction.*

Halliday (1943), in a discussion of the principles of aetiology, has pointed out that for preventive medicine the most fruitful approach to the study of the environment as a cause of illness has been the splitting-up of the environment into various *factors* by the successive application of different techniques. Ecological technique deals with social factors, but the interaction of environmental factors in the development of mental disease is so complex that the division between social, psychological and physical factors is often arbitrary. Some examples will show this.

The imbibition of alcohol is the immediate and essential physical cause in the development of alcoholic psychoses, but the factors which determine the availability of alcohol and whether it is consumed to excess are largely social. Thus Hyde and Chisholm (1944) showed that whereas the incidence of alcoholism was high among negroes and Portuguese near Boston, it was low among Jewish communities of comparable social status and population density. The most probable explanation of this is that alcoholism is not a culturally permitted mode of escape from frustration among Jews. Moreover, Dayton (1940), from a study of admissions to Massachusetts mental hospitals during 1917 to 1933, has shown that there is a high correlation between alcoholic intemperance and the total admission rate, suggesting that alcoholism may be related not only to alcoholic psychoses but to other types of mental disorder (in particular, schizophrenia, psychosis with cerebral syphilis and involutional psychosis).

---

* This is strikingly illustrated by the fact that persons born blind who later gain their sense of sight by a surgical operation cannot " see " at all in the ordinary way until that sense has been educated for many months.

Again, figures given by Stocks (1949) indicate that there is (in England and Wales) a seasonal variation in the incidence of nervous complaints, which cause much more incapacity in winter than in summer months. This might be thought to demonstrate the influence of weather on neurosis, but his figures also show that the incidence, high in October and November, falls sharply in December and then rises again in February and March. Such an occurrence is inexplicable on a purely physical theory; but it is readily understood if neurosis is due to social frustrations which are relieved by the good-will and festivities of the Christmas season.

Recent work has also tended to blur the distinction between social and psychological factors in mental disease. In his early writings Freud (1924) conceived psychological stress as the result of clear-cut traumatic situations disturbing a pattern of mental development which had been inherited and was universally similar. Malinowski (1927) showed that in cultures far removed from that of modern western civilization the pattern was essentially different, and situations which were traumatic in one culture were not necessarily so in another. Practical experience in psycho-analysis led Burrow (1927) to the conclusion that neurosis was essentially a social phenomenon—a view which led him to adopt the methods of group psychotherapy. Although Klein's theories (Klein, 1950) seem to represent a return to the conception of inherited patterns of mental development, yet the general body of psychoanalytic thought has shown " a growing appreciation of the social involvements of the personality and the social precipitation of neurosis " (Miller, 1950). In addition, there is growing evidence that the disposition towards mental disorders, both neurotic and psychotic, may develop from an emotionally unsatisfactory family background, especially where the parents or those in *loco parentis* are themselves mentally unstable. (Gerard and Siegel, 1950; Malamud and Malamud, 1943; Ingham, 1949; Pemberton, 1951.)

The basic conflict of opinion has been summed up by Blumer (1937); on the one side there are those who hold that social disorganization is the *result* of individual disorganization, which is itself the result of childhood frustrations; on the other are those who hold that social disorganization, the consequence of impersonal factors such as inventions, redistribution of wealth, new philosophies, etc., is the *cause* of the individual disorganization. Blumer himself inclines to the latter view.

It will be convenient in surveying the ecological factors in mental disease to consider them under the following headings:

1. Culture.
    (*a*) Mental disease in different cultures.
    (*b*) Mental disease in a changing culture.
2. Migration.
3. Population pressure.
    (*a*) Mental disease and isolation.
    (*b*) Mental disease and urban conditions.
4. Local and temporary factors.

1. *The Influence of Culture.*

(a) *Mental Disease in Different Cultures.*

If culture is an important factor in the development of mental disease, then it is to be expected that the incidence and variety of these diseases will be different in different cultures. Attempts to verify this hypothesis, however, are confronted with two major difficulties. Firstly, as Toynbee (1934) has pointed out, every civilization except our own has been infected with the virus of Modern Western Civilization. There are no pure cultures left, and the best that can be done is to investigate those preliterate societies which are minimally affected by modern culture. In such cultures, the difficulty of obtaining accurate information and of establishing satisfactory standards of abnormality is great. Secondly, mental diseases are not clear-cut illnesses but deviations from local standards of normality : " the limit beyond which idiosyncrasy becomes abnormality is never precisely defined and is set by the consensus of opinion characteristic of the age or of the community " (MacCurdy, 1950*a*). It follows that mental disease is defined in cultural terms and therefore that diseases in different cultures cannot be accurately compared.

In spite of these difficulties, there is considerable evidence that the amount and kind of mental disease varies with culture. Faris (1934) quotes references to show that schizophrenia is rare or absent among primitive peoples unless they have migrated or become urbanized. Thus Faris (op. cit.) found no cases resembling schizophrenia among the Africans of the Belgian Congo, although schizophrenia is common in American negroes. Working among primitive natives of Papua, Seligman (1929) found no evidence of mental disorder (except brief maniacal attacks) in those who had never been influenced by European civilization ; but mental disorders were not uncommon among those who had been so influenced, and they also occurred among devotees of new religious cults where there was evidence of a conflict between old and new ideas. Dhunjibhoy (1930), reviewing the psychoses that occur in Indians, considered schizophrenia to be more common in those communities (e.g., Parsees) which were " highly advanced in Western civilization."

According to Van Loon (1927), the condition known as amok is a characteristic reaction of Malay males when they become confused (for it may occur in any state of acute confusion, whether due to febrile delirium, toxins or mental disorder). He ascribes its features to the cultural conditions ; for whereas in a European acute confusion may result in " occupational delirium," the Malayan's response is that of one who lives in a jungle village surrounded by hostile tribes and wild beasts and whose first impulse when uncertain of his surroundings is to attack any potential enemy he meets. Similarly, he ascribes the state of latah (automatic obedience in Malay women, principally in those who have worked with Europeans) to the habit of imitation and suggestibility engendered by contact with a more advanced culture.

Benedict (1934) has described a culture (the Dobu, off New Guinea) in which there is a preponderance of paranoid personalities.

A study of insanity among Africans in Kenya has been made by Carothers (1947, 1951). He finds its incidence very low among those who live in their traditional environment and considers this due to their freedom from social, sexual and economic problems. The African community does not require foresight or initiative from its members but only that they obey the rigid code of tribal etiquette ; in consequence, the Africans do not develop any personal standards of behaviour, and Carothers considers this to be the explanation of the fact that he never saw a case of obsessional neurosis among them.

In summary, the anthropological evidence indicates that mental disease (as understood in civilized countries) does not occur in many primitive cultures, and where it does occur then either the culture has been in contact with civilization or it contains within its structure sources of mental conflict similar to our own.

(b) *Mental Disease in a Changing Culture.*

Since the beginning of the Industrial Revolution, the pattern of culture within Western civilization has been changing at a rate never known before. If culture is an important determinant of mental disease, then we may expect to find corresponding changes in the variety and incidence of mental disease during the past century. There is a good deal of evidence to support this hypothesis.

In the first place the incidence of mental disorder as a whole appears to be increasing, although there are great difficulties in establishing this fact for certain. The statisticians of the early nineteenth century too readily supposed that the obviously increasing admission rates to asylums indicated a real increase in insanity. It remained for Tuke (1878, ch. 7) to point out that most of this increase could be accounted for by various Acts of Parliament which resulted in more paupers being called lunatics and more lunatics being notified as such. Greenwood (Greenwood *et al.*, 1941) has shown that the suicide rate in England and Wales increased steadily from 1861 to 1938, although he attributed a substantial (though undeterminable) part of this to the availability and convenience of gas ovens. Dayton (1940), from his study of first admissions in Massachusetts from 1917 to 1933, found (ch. 2, p. 59) that the incidence of mental disease was decreasing in the under-40 age-groups and considers this an indication that mental hygiene activities have been of real value; but he also concluded (ch. 11, p. 417) that the total incidence was really increasing, though so gradually as to give no cause for alarm. A similar though less complacent conclusion was reached by Malzberg (1943) who found in New York State during the years 1920 to 1940 that the annual first admission rate to mental hospitals increased from 109 to 136 per 100,000. He also pointed out that the rate for dementia paralytica had decreased and that, since almost every case of this disease sooner or later comes to a mental hospital, this was an argument against the general increase being due to an increased rate of hospitalization.

There is also evidence of a change in the relative prevalence of different mental diseases during the past century. It is now generally accepted that the "grande hystérie" of Charcot's Salpêtrière clinic was a product of the age, place and prevailing psychiatric theory. MacCurdy (1939) has stressed that the now classical examples of neurosis on which Freud built his theories were not of timeless pattern, but reflected the cultural atmosphere of *fin-de-siècle* Vienna. Many authors have drawn attention to the changing fashions in the symptomatology of the visceral neuroses (for example, Banks, 1950*b*), while Halliday (1948) has shown that these changes can be correlated with such social changes as the emancipation of women and the disruption of the patriarchal family group. This same author (op. cit.) has suggested an explanation in cultural terms of the different prevalence of hysterical and obsessional neuroses (and of the corresponding personality types) in the Victorian age and in our own. The large families of the Victorians provided their children with freedom of expression and a wealth of social contact among siblings; big nurseries and adequate domestic help rendered a premium on strict bowel-training unnecessary; but the patriarchal structure of the family and the prevalent opinion that children should be seen and not heard led to a suppression of the development of individual personality and (in women) to a repression of sexual impulses. A personalty so moulded tends (on psychoanalytic theory) to become hysterical. By the twentieth century, however, these early influences had changed: small families were the rule; mothers took more pride in and expected greater perfection from their fewer children; breast-feeding declined and bottle-feeding by the clock was substituted; the benefits of increased sanitation led to a firmer emphasis on cleanliness and so on training; more babies were in prams and few in arms; the "dummy" became anathema. It is this rigidity of upbringing (itself perhaps a reflection of the need for a sense of security in a drifting world) which has produced the obsessional personality of our times.

Haliday's theory is of special interest as it may soon become susceptible to validation. During the past ten years the principles of bringing-up children have changed once more. Breast-feeding has become fashionable again, comforters are permitted and even encouraged, and if, as has been reported (Corwin, 1947), the "self-demand" method of infant feeding does away with feeding difficulties, then this is also likely to achieve widespread popularity. The children of these principles will mature during the next decade or so and it may then be possible to determine if the prevalent type of neurosis changes in the way that the theory predicts.

2. *The Influence of Migration.*

In a complex society, the struggle for survival is constantly tending to produce a selfishness and competition in which individuals are regarded either as rivals or as mere utilities to each other. This socially disruptive tendency is normally balanced by the integrating forces of mutual affection and sentiment. Migration, as Faris (1944) has observed, upsets this balance in two ways. Firstly, by his separation from a community where he was an accepted member and his entry to one where he must win his way, the migrant is forced to adopt a more competitive attitude to life. Secondly, from contact with other ways of life, he loses the sense of the sacredness of those customs in which he was brought up and so stands in danger of losing awareness of the fact that without some such customs society could not exist at all. On the hypothesis that individuals become unstable when their social life disintegrates, it is to be expected that migration will be associated with an increased incidence of mental disease. Some evidence for this will now be considered.

Dayton (1940, ch. 3) showed that in Massachusetts between 1917 and 1933 the incidence of admissions to mental hospitals was highest in the foreign-born population and decreased by regular steps in the native-born of foreign parents, of mixed parents, and of native parents. He also showed that younger migrants tend to break down sooner than older ones and that the excess of male over female admissions was higher in the native-born of foreign parents than in the other groups. Although he suggests no reason for these findings, they are explicable on the assumption that these groups are more exposed (the foreign-born) or more susceptible (the young, and the native-born sons of foreign parents) to the stress of acculturation.

Hyde and Chisholm (1944), in a study of mental disorder among 60,000 army recruits from Boston, found a high incidence of psychopathy in negroes, Irish and Italians, and considered that the stress to which these immigrant minority populations are subject is a causative factor. They argue that immigrants who experience the effects of xenophobia tend to segregate themselves from the surrounding community and to bring up their children in the old culture to which they cling. The children are thus torn between the culture of their home and that of their school, and the conflict leads to a distrust of sentiment and a disrespect for authority which results in antisocial and psychopathic behaviour. This view is supported by the work of Glueck (1918) who showed that the crime rate is higher among native-born children than among their immigrant parents; and by that of Faris and Dunham (1939) who showed that the same is true of the incidence of dementia paralytica.

The psychological consequences of enforced migration have been studied among "displaced persons" come from Europe to Canada (Tyhurst, 1951). After an initial period of over-activity and euphoria, the migrant gradually becomes aware of language difficulties, differences in custom and value, and a sense of not belonging to the community. He develops a feeling of helplessness, which in turn engenders frustration (leading to symptoms of anxiety and depression), egoism (leading to somatic complaints) and aggression (leading to paranoid trends and hostility to natives). The author considers that his hostility increases xenophobia so that a vicious circle is set up.

Another example of the effects of migration can be seen among people who move from the country-side into the town. This move, as Hyde and Chisholm (1944) have pointed out, is often associated with a great change in cultural atmosphere. In rural areas the effect of law is small but the pressure of social opinion is high; in big towns the opposite is true. They consider that this migration accounts in part at least for the high rate of mental deficiency among Chinese and Negroes in Boston—suggesting that their apparently low intelligence is really "an attitude of stupidity" which country folk are inclined to adopt in the face of difficulties. Similar conclusions on the effect of rural-urban migration on mental disease were reached by Sorokin and Zimmerman (1929).

From the ecological view-point movement from one social class to another may also be considered a form of migration. Not much work has been done on this problem, though Faris and Dunham (1939) have shown that the incidence of alcoholism is high among people who live in districts of a different social level from those in which they were born. They put forward the suggestion that cleverer and more ambitious individuals migrate to better areas and then tend, if they find the competition too severe, to take to drink.

3. *The Influence of Population Pressure.*

(a) *Mental Disease and Isolation.*

Although the relation between mental disease and the physical isolation of an individual from his fellow-men is not of much practical importance in planning for mental health, the theoretical implications are very great. For if a relation can be established, it will support the hypothesis that cultural contact is essential for normal mental health.

From the statistical aspect, Hyde and Kingsley (1944*b*) have shown that mental disorder (as measured by the rejection rate of recruits from the environs of Boston) is high in sparsely-populated areas. The rate was 12·1 per cent. where population density was less than 500 per square mile, as compared with 7·5 per cent. where density was 500 to 1,000 per square mile. Evidence is also provided by the work of Hobhouse and Brockway (1922). They showed that prisoners kept in solitary confinement or in silence had a high insanity rate ; and also that, even when frank insanity did not develop, such prisoners became dull and introverted and ceased to be interested in their visitors or the prospect of their release.

Faris (1934) has drawn attention to the fact that shepherds and persons who live in remote regions or have little contact with other men become seclusive, avoid companionship, and are suspicious and irritable with strangers. He also quotes references which indicate that in communities where social isolation is impossible there are no schizoid personalities and no schizophrenia.

Social isolation is a fate which befalls many old people through retirement from work, bereavement or physical incapacity. In discussing mental deterioration among the aged in Wolverhampton, Sheldon (1948) observes that " domestic anxieties, loneliness and physical defects with consequent limitation of movement appear to be important underlying causes which—by depriving the old person of the feeling that he or she is still necessary and that there is something to live for—seem to induce mental failure " (p. 109). He draws attention (p. 135) to the fact that many old people who live alone do not complain of loneliness. These people, although happy and in good health, are described as solitary eccentrics and of paranoid personality. The difficulty of deciding what constitutes " isolation " is reflected in a paper by Post (1951). He found no clear correlation between breakdowns of 226 old people in South London and their social isolation as measured in terms of living alone or with relatives, but he admits that these criteria may not be satisfactory.

The importance of social contacts for mental health is further illustrated in a paper by Line (1951). He quotes an unpublished thesis of Sawatsky, from the University of Toronto, in which it was shown that the " service " departments of a large business firm had lower rates of sickness, accident, alcoholism, grievances and turnover than " production " departments ; and that this lower rate occurred wherever the work involved immediate service to fellow-workmen, easy communication, and opportunity to determine the quality of performance.

Finally, mention may be made of Fraser's study (1947) of neurosis among 2,400 factory workers. He found that a more than average incidence of neurosis occurred in those workers whose social contacts were restricted, while the reverse was true of those whose social contacts were above average. It is possible to criticize this work, however, on the grounds that the meaning of neurosis was not very adequately defined—a criticism which can be made of most statistical studies of this indefinite subject.

(b) *Mental Disease and Urban Conditions.*

It has long been known that the incidence of vice, crime, suicide and mental disease is higher in urban than in rural areas, and the evidence for this is now overwhelming (for example, Tuke, 1878, ch. 5 ; Sorokin and Zimmerman, 1929 ; Dayton, 1940, ch. 10). Its significance is less clear. During the past 20 years detailed analyses of the variations within urban areas have been made with the object of shedding more light on the causal relation between big cities and social disintegration. There are two outstanding contributions in this field : that of Faris and Dunham, and that of Hyde and Kingsley.

Faris and Dunham (1939) studied the home distribution of over 20,000 cases admitted to the mental hospitals of Chicago between 1921 and 1931. They showed :

1. That the total insanity rates followed the ecological structure of the city, being highest in areas of social disorganization (slums, " hobo " areas), and steadily declining towards the periphery of the city.
2. That the distribution of the different types of insanity was not the same. Schizophrenia followed the ecological pattern very closely ; senile psychosis, alcoholism and dementia paralytica somewhat less closely ; manic-depressive psychosis and epilepsy not at all, being randomly distributed.
3. That the varieties of schizophrenia were differently distributed, paranoid schizophrenia being most common in communities which were highly mobile (as measured by the percentage of home-owners, lodgers and single persons), and catatonic schizophrenia in the slum-areas of the foreign-born.

4. That in negro areas the incidence of schizophrenia in negroes was low, but in whites was high, while the converse was true in the white areas. The same differential incidence in minority areas held for dementia paralytica.

5. That the variation in the rates for the foreign-born was not correlated with their varying proportions in different areas, implying that race difference was not an important factor in mental disease.

They next considered the possible significance of their findings. These might be due to chance; but apart from the statistical improbability, a similar (though less detailed) study in the city of Providence yielded the same results. They might be due to a failure to make statistical allowance for the rapid turnover of population in the "mobile" areas; but this mobile population presumably comes from and goes back to other big cities, and even if the rates for the mobile areas were divided by three (allowing for a total turnover of population three times each year) they would still be very high. It could be argued that poor people with mental disease are more likely to be admitted to institutions than rich people, and that this is sufficient to explain the excess of cases from the poorer areas; but if that were the principal factor, then the different types of illness should all show the same pattern of distribution. Finally, the observed distribution might be explained on the assumption that schizophrenics (and to a less extent the seniles, alcoholics and paretics) drift, because of their incapacity, into the areas of disintegrating social life. This assumption can be tested by a comparison of old and young cases, for the older cases have had more time to drift and should therefore be in higher concentration in the hobo areas. Such a comparison was made for paranoid and catatonic schizophrenia, but no significant difference was found.

The authors are thus led to reject each of these explanations and conclude that "the conditions of social life in certain areas are causal for psychosis." They also conclude that the contrast in distribution of schizophrenia and manic-depressive psychosis lends support to the clinician's view that there is a real distinction between these two diagnoses; and that the same is true of the paranoid and catatonic varieties of schizophrenia.

Two criticisms may be made of this work. Firstly, the author's reason for rejecting the significance of "drift" is not altogether satisfactory, for people may drift to disorganized areas long before they become ill—that is, the drift may represent a segregation of personality types rather than of pre-psychotics. Secondly, the authors relied for their diagnosis upon that given in the hospital records, but differential diagnosis in psychotics is notoriously unsatisfactory, and more especially so when the diagnoses are made by a multitude of physicians working in different hospitals for a decade;* and if the diagnostic groups are misleading, then the argument against the selective factor due to poverty loses its force.

This second criticism cannot be made of the work of Hyde and Kingsley (1944*a*), who personally examined 60,000 army recruits and did not attempt to subdivide the psychoses. They classified the homes of these recruits into six grades according to the "desirability" of the district, and showed that the percentage of men rejected for service on psychiatric grounds increased steadily from 7·3 in the highest grade areas to 16·6 in the lowest. They also showed that whereas this trend was present for psychosis and mental deficiency it was less marked for chronic alcoholism and psychopathic personality, and absent for psychoneurosis. The fact that their results agree with those of Faris and Dunham supports the general conclusion that there is a relation between social conditions and mental disease.

In a further study (Hyde and Kingsley, 1944*b*), the authors investigated the relation between mental disease and population density. They were able to compare groups in such a way as to eliminate the effects of nationality and socio-economic levels. The total incidence of mental disease (as measured by the rejection rate) was found to increase regularly from 7·5 per cent. where the population density was 500 per square mile to 14 per cent. where it was over 20,000 per square mile. The incidence of chronic alcoholism and psychopathic personality was consistently correlated with population density, and they suggest that the former is due not only to the greater number of bars and stronger advertisement stimulus in crowded areas but also the pressure of competition and customs of privacy which make sociability difficult without alcohol.

---

* Strömgren (1948), observing that in some state hospitals 9 per cent. of admittances are schizophrenics, in others 41 per cent., remarks that this "cannot be solely the fault of the patients."

4. *The Influence of Local and Temporary Factors.*

Besides large-scale investigations into the general effect of social and cultural conditions on mental disease, a number of studies have been made to determine and analyse the effects of local and temporary conditions of stress. Some of these will now be briefly mentioned.

(a) *War.*

Dayton (1940, p. 18) found a higher incidence of mental disease in Massachusetts during the first World War (1917–18) than subsequently and concluded that this was due to the stress and emotional turmoil occasioned by that event, but he has no pre-war figures for comparison, a fact which also detracts from the significance of his finding (page 346) that certain psychoses (e.g., dementia praecox) were more common then, while others (e.g., the manic-depressive group and psychoneurosis) were less so.

Before the second World War it was widely anticipated in Britain that the bombing of cities would disintegrate civilian morale and cause many psychiatric casualties. This did not happen, and a study by Hemphill (1941) led him to the conclusion that " the early effects of war on the mental health of a large city are negligible." He found that the admission rate to Bristol Mental Hospital was less in 1940 than in the previous 5 years, and in only 25 of the 354 admissions could war be accounted even a minor contributory factor. He suggests that the increased social cohesion and sense of purpose more than outweigh the purely physical and mental strain on the population of a bombed city.

Combatants in wartime are liable to undergo severe stress from fatigue, privation and the sense of danger. A clinical study of stress among bomber crews of the Royal Air Force has been made by Symonds (1943) and his figures have been analysed statistically by Reid (1948). Symonds points out that the condition known as " flying stress " was recognized during the first World War, and was thought at first to be an occupational disease due to fatigue or lack of oxygen. Later, when flying stress was shown to occur in airmen who had flown neither for long hours nor at high altitudes, a temperamental unfitness for duty was assumed. Symonds' study of cases in the second World War indicated that although the predisposition to neurosis led a man to break down sooner, the precipitating cause (or, in ecological terms, the limiting factor) was a breakdown in morale due to the apprehension of being killed. Reid showed statistically that a high casualty rate was associated with an increased incidence of neurosis, and also that the factor of apprehension was more decisive in precipitating neurosis than was prolonged or intensive effort.

(b) *Academic Education.*

Striving for academic honours may be a consequence either of ambition or of the desire to uphold a favourable opinion bestowed on one by past successes or praise. In either case, it has been commonly supposed that the strain on the studious scholar may be very great. As far back as 1876 Farquharson, writing in the *Lancet*, pointed out that young men at a university are at a sensitive period of life and may feel that success or failure then will make or mar their career ; " the element of anxiety comes into play, sleep is disturbed, exercises neglected, digestion suffers and the inevitable result follows of total collapse from which recovery is slow and perhaps never complete." Tuke (1878, ch. 6) held that excessive cramming for competitive examinations was one of the principal causes of insanity in the higher classes ; " it seems to be thought," he says (page 112), " that the cubic capacity of the British skull undergoes an extraordinary increase every few years and that therefore, for our young students, more subjects must be added to fill up the additional space."

More recently an investigation into the health of Oxford undergraduates has been made by Parnell (1951). He showed that over a three-year period there were 9 suicides, an incidence much higher than in the equivalent social classes throughout the country. Although this figure is too small to be very significant, he also showed that the illness which caused 145 students to lose a term or more was in over 50 per cent. of cases a mental illness. His conclusions are that between a half and one per cent. of undergraduates suffer a serious mental illness or nervous breakdown each year, and that this high incidence is presumably correlated with the stress and competition of academic life.

(c) *Hospitalization.*

It is somewhat too naïvely assumed that the removal of a patient to hospital may do him good but cannot in any case do him harm. Although, of course, hospitalization is never likely to be a major factor in the development of mental disease, there is some evidence that the conditions in certain types of hospital are not so entirely conducive to mental health as is commonly presumed. A recent annotation in the *Lancet* (1950) drew attention to the psychological effects on patients and their relatives of the alarming names which hospitals have possessed—names including the words " cancer," " consumption," and " for the dying." Some of these names have recently been altered. It is becoming the practice to drop the word " mental " (a word which seemed, after its official adoption at once to take over the unhappy connotation of its predecessor " asylum ") from the names of mental hospitals.

Exton-Smith (1951) has indicated that, in the opinion of the staff, relatives and patients themselves, aged people in a municipal hospital before the National Health Act were admitted there to die and that the lack of active treatment and the atmosphere of hopelessness led to apathy and mental deterioration among the patients. A fresh approach to the prognosis and treatment has led to a reversal of the effect of hospitalization on the mental health of the aged.

The dangers attendant on the prolonged hospitalization of children have been stressed by Hunter (1949) and by Anna Freud, while Bowlby (1951) quotes evidence to show that maternal deprivation in early childhood (such as may occur in hospital) can have a far-reaching effect on mental health.

Although, from a study of 116 cases, Hemphill and Murphy (1951) conclude that hospitalization is not an important factor in the aetiology of puerperal psychosis, the history given in the Appendix (p. 594) suggests that hospital environment may occasionally play a part.

SECTION D.

AN EVALUATION OF THE EVIDENCE.

The total amount of mental illness and the degree of social inefficiency which it occasions is staggering and is a tremendous challenge to medicine. " For all industrial civilizations, mental illness has become a problem of the greatest urgency." (Rodger, 1948.) In the second World War, psychiatric disorders were by far the largest single cause (in America and in Britain) of unfitness for service. Fraser's work (1947) indicates that neurosis is probably the largest single cause of loss of working time in industry. The proportion of patients who visit their doctor's surgery with mainly psychological complaints has been variously estimated at between 30 and 50 per cent. (Donnan, 1947). Stock's figures (1949) suggest that more than 25 per cent. of all incapacity due to sickness is caused by neurosis or psychosomatic disorders. Furthermore, it seems likely (from the evidence already summarized) that the amount of mental illness is increasing.

With such a vast amount of ill-health, prophylaxis offers more hope than treatment ; as Rees (1950) has said, " Neurosurgery and psychoanalysis are negligible in the face of the major problems." The importance of the ecological approach is that it seeks a rational basis for preventive psychiatry (for the empirical treatment of diseases, however successful, adds nothing to our knowledge of their cause). Although the principles of ecology are simple, the complexity of its material, the difficulty of demonstrating the effect of one among a great number of interacting factors, and the impossibility of establishing a causal connection other than by sheer weight of statistical probability, make the significance of its results still largely a matter of opinion. In evaluating the evidence presented in Section C, it must be remembered that this has of necessity been abstracted and somewhat simplified ; no mention has been made, for instance, of the relation of mental disease to race, nationality, religion or economic level,* nor of the ecological relation between the incidence of mental disease and that of many physical diseases such as venereal disease, pulmonary tuberculosis, arteriosclerosis, and the psychosomatic disorders.

---

* It may be observed in passing that these factors, with the exception of economic level, are not thought to be of much causal significance by the majority of investigators.

The evidence clearly indicates that there is an association between mental disease and social factors. The first great question is : are these social factors causal in the disease or are they symptomatic of the underlying constitutional tendencies ? The causal significance of the ecological distribution of certain psychoses has been criticized on the basis of diagnostic difficulties, the selective factor in hospitalization and the tendency to " drift." Another criticism has been made by Krout (1938). Commenting on the findings of Faris and Dunham (see Section C, 3*b*), he argues that the distribution of schizophrenics and manic-depressives can be explained on psychoanalytic theory : the parents of schizophrenics live on a low social level and so cause their children more and earlier anxiety-provoking situations, leading to frustration at the early oral level and so to the liability to schizophrenia ; whereas children of better-class parents suffer frustration more at the anal level and so develop a character-structure of the manic-depressive type. However, the general weight of evidence seems to show, and it is part of the thesis here maintained, that social factors are directly and significantly causal in mental disease. Granted this, it remains to discuss the second great question : which of the social factors are most responsible for causing mental disease ?

It will be convenient to employ here a concept which has proved useful in plant and animal ecology, that of " limiting factors." A large number of factors are always operative in any particular ecological pattern, but it often happens that the stability of the pattern depends in practice upon only one or a few of these factors, which are then termed limiting factors.* The thesis adopted here is that social communication between individuals is a limiting factor in the maintenance of mental health, and that in modern Western civilization the breakdown of social communication is one of the principal causes of mental disease. By " social communication " I mean the process through which an individual both satisfies his need to feel an accepted member of a stable community and at the same time is subjected to the informal social control which conduces to conventionality in behaviour.

This thesis represents a view which has been expressed by many workers. Blumer (1937) defines social disorganization as a loss of common objectives between individuals, and suggests that it leads to individual disorganization by causing a confusion of aims, a sense of isolation and a loss of " personal orientation." Rodger (1948), addressing the International Congress of Mental Health, said, " It has become clear that the basic fault . . . is the distortion in the structure of society which occurs as a community becomes progressively industrialized " ; the modern town dweller fails to obtain the satisfaction of participating in group activities whose nature he understands ; the recent great increase in psychological disturbance indicates that we are approaching the limit of man's adaptability with the consequence that primitive impulses are less constrained ; " our only hope lies in establishing conditions which will create fresh possibilities of co-operative life." MacCurdy (1950*b*) has argued that man, in addition to the sensory basis of social cohesion which obtains in animals, has also a system of beliefs and behaviour (the *ethos*) whose acceptance by an individual symbolizes his membership of the group ; but that when he loses contact with it or it changes suddenly or markedly, he becomes disquieted and is apt to panic like a lost sheep.

According to Faris (1944) the weakening of the consensus unity in society is one of the basic causes of social disorganization in industrial civilizations and an underlying condition of much of the abnormal in human behaviour at the present time. He considers that communication is essential for normal mental development and has developed the hypothesis that schizophrenia is due to progressive isolation of the individual from intimate social relations. This hypothesis is based on the observation that many schizophrenics were " spoiled " as children (see also Gerard and Siegel, 1950 ; Malamud and Malamud, 1943) ; and he suggests that this led them to an unreal picture of themselves with consequent rejection by others and the development of a vicious circle. His opinions have the approval of Hyde and Kingsley (1944*b*), who believe in addition that the *type* of culture is an important determinant of mental disease because it governs not only the type of stress but also the acceptability of normal and abnormal outlets.

---

* An example may be quoted from Elton (1950). The number of crayfish present in French streams, although influenced by such factors as salinity, aeration and sunlight, is in practice limited by the amount of calcium carbonate in the water. Where calcium carbonate is absent, there are no crayfish ; where its concentration is high, crayfish are abundant.

The relation between mental disease and various social factors can thus be largely explained in terms of the breakdown of social communication. We may briefly examine, from this point of view, the findings of Section C.

Culture and migration.—An individual's personal orientation and sense of membership of a stable group is disturbed when he suffers from a clash of cultures. This will account for much of the mental disease which occurs in primitive societies coming under the influence of civilization and also for that associated with migration. It may further be argued that the high incidence of mental disease in our own civilization is due, partly to the fact that an increasingly complex culture develops an increasing number of incompatible patterns (which means, in effect, that there is a clash of inter-cultural patterns) ; and partly to a rate of change so rapid that children brought up to one set of rules are confronted with a different set by the time they reach maturity.

Population density.—In sparsely populated rural areas there is monotony, absence of urban " necessities," and a lack of stimulation from outside contacts ; in big towns there is intense competition, anonymity and an excess of passive entertainment. All these factors make for difficulty in social relations. In the central and most over-populated areas of big towns the mobility of the population prevents the establishment of enduring friendships, while the high proportion of unmarried adults reduces the influence of family ties.* The prevailing cultural ambition of men to get on, make money and do better than anyone else (Mead, 1949) militates against social cohesion, while the unpreparedness of the modern " lady clerk " for marriage and her resulting incapacity for neighbourliness has been well described by Pearse and Crocker (1943) and is probably in part responsible for the so-called suburban housewives' neurosis. Such an interpretation leads to the natural corollary that social needs at the present time are most adequately satisfied in small towns and semi-rural communities (Mumford, 1938 ; Hyde and Kingsley, 1944*b* ; White, 1951).

War.—The somewhat unexpected finding that the second World War had no great effect on the incidence of mental disease among civilians is explained if we assume that the increased fatigue and apprehension were compensated by the increased sociability and sense of purpose which the war engendered. Among fighting forces, where the importance of morale has always been recognized, the work of Symonds and of Reid shows that mental disorder occurs when the factor of apprehension outweighs that of morale. We can therefore say that morale (which is essentially a measure of the degree of social communication within a relatively small group) is a limiting factor in the mental health of combatants.

Academic education.—The struggle for academic success parallels that in other fields, but is apt to be more severe because scholars are imbued with the belief that the harder they work the greater their success will be. It may be tentatively suggested that relative social isolation results both from the competitive atmosphere and from the fact that many scholars are struggling to maintain a false opinion of themselves (which, as in the case of spoiled children, leads to their rejection by others).

Hospitalization.—The hypothesis that social isolation is a common factor in mental disease readily explains the mental deterioration of the aged in a hospital where all hope of return to family life is abandoned and where the contractures which result from confinement to bed prevent sociability even among the patients. Children in hospital have every physical need satisfied but it is clear that they are isolated from their principal source of social communication and it seems reasonable to attribute the adverse effects (described by Bowlby and others) to this isolation.

Finally, if the hypothesis is true, then the factor of morale will be of great significance in the treatment of the mentally ill. This opinion has frequently been stressed (Michaels, 1947 ; Anderson, 1950). Solomon (1950) states that the recovery rates in American mental hospitals were high in the eighteen-fifties, but fell at the end of the nineteenth and beginning of the twentieth centuries. He correlates this with the early optimism of the physicians and their later pessimism. Rubé (1948), noting that the remission rates of schizophrenics in hospital rose each time a new treatment was introduced and gradually fell back to that of the "spontaneous" remission rate, concluded that the important factor was the attention which patients received, while Freudenberg (1947), though less sceptical about the benefits of insulin coma therapy, observes that patients undergoing that treatment do better when treated in groups.

---

* Halbwachs (quoted by Faris, 1944) showed that in France the expectation of suicide in a parent decreased as the number of his children increased.

CONCLUSION.

From a survey of the principal facts which are revealed by the ecological approach to mental disease, it is possible to distinguish, in every environmental situation, a constant underlying factor necessary for mental health. This factor, which may be called "social communication," reflects the fact that a human being's normal mental development depends upon his being able to borrow a sense of security from a community by whom he is accepted as a member. Without such a sense of security he can neither develop nor maintain the degree of mental integration which has become normal for social man. The price each individual must pay for this sense of support is conformity with the cultural traditions of his community. Thus a person may be deprived of social communication either because his social environment does not provide sufficient stability or control, or because he cannot or will not conform with its conventions; in either case the social isolation which results constitutes a threat to his mental health.

If this hypothesis is accepted, then a further conclusion may be reached. The rapid changes in the established modes of thought and behaviour which have been occurring all over the civilized world during the past century and a half and which have been due for the most part to scientific discovery and technological progress, have made it increasingly difficult for individuals to obtain the degree of social communication necessary for mental stability. In other words, social communication has become a limiting factor in mental health.

The two questions posed in Section A (p. 579) can now be tentatively answered. We can say, firstly, that at the present time the conditions of modern Western civilization are becoming increasingly important in the aetiology of mental disease; and, secondly, that the principal causative factor in these conditions is lack of the sense of security and worth which an individual must derive from a social group. Such a hypothesis offers a rational approach to the problems of social psychiatry.

SUMMARY.

1. The connotation of the word "ecology" in relation to mental disease is considered and a definition adopted.

2. A historical account of the development of the ecological approach to mental disease is given, and recent work on the subject surveyed.

3. The significance of ecological factors in mental disease is critically assessed and the hypothesis put forward that social communication is a limiting factor in the maintenance of mental health.

4. The principal findings of ecological work on mental disease are shown to be explicable in terms of this hypothesis.

REFERENCES.

ANDERSON, L. S., *Am. J. Psychiat.*, 1950, **106**, 486.
BANKS, A. L., Inaugural Address at the University of Cambridge, 1950*a*. Cambridge University Press.
Idem, Lancet, 1950*b*, ii, 833.
BENEDICT, R., *Patterns of Culture*, 1934, ch. 5. Boston.
BEWS, J. W., *Human Ecology*, 1935, ch. 1. London.
BLUMER, H., *Am. J. Sociol.*, 1937, **42**, 871.
BOWLBY, J., *Maternal Care and Mental Health*, 1951. London: H.M. Stationery Office.
BUCKNILL, J. C., and TUKE, D. H., *A Manual of Psychological Medicine*, 1874. London, 3rd ed., ch. 2, p. 114 ff.
BURROW, N. T., *The Social Basis of Consciousness*, 1927. London. Introduction.
CAROTHERS, J. C., *J. Ment. Sci.*, 1947, **93**, 548.
Idem, ibid., 1951, **97**, 13.
CORWIN, E. H. L., *Ecology of Health* (edited by), 1947. New York.
DAYTON, N. A., *New Facts on Mental Disorders*, 1940. Springfield.

DHUNJIBHOY, J. E., *J. Ment. Sci.*, 1930, **76**, 254.
DONNAN, L. F., *Brit. Med. J.*, 1947, ii, 396.
ELTON, C. S., Article "Animal Ecology" in the *Encyclopedia Britannica*, 1950, 15th ed.
EXTON-SMITH, A. N., "The Hospital and Domiciliary Care of the Aged Sick," a thesis for the degree of M.D. at the University of Cambridge, 1951.
FARIS, R. E. L., *Am. J. Sociol.*, 1934, **40**, 155.
Idem, in *Personality and Behaviour Disorders*, ed. J. McV. Hunt, 1944, vol. II, p. 736. New York.
FARIS, R. E. L., and DUNHAM, H. W., *Mental Disorders in Urban Areas*, 1939. Chicago.
FARQUHARSON, R., *Lancet*, 1876, i, 9.
FRASER, R., *The Incidence of Neurosis in Factory Workers*, 1947. London: H.M. Stationery Office.
FREUD, A., *Lancet*, 1949, i, 784.
FREUD, S., *Collected Papers on Psychoanalysis*, trans. J. Riviere, 1924, vol. I, papers IX and X. London.
FREUDENBERG, R. K., *J. Ment. Sci.*, 1947, **93**, 9.
GERARD, D. L., and SIEGEL, J., *Psychiat. Quart.*, 1950, **24**, 47.
GLUECK, B., *Ment. Hygiene*, 1918, **2**, 85. Quoted by Hyde and Chisholm (1944).
GREENWOOD, M., MARTIN, W. J., and RUSSELL, W. J., *J. Roy. Stat. Soc.*, 1941, **104**, ii, 146.
HALLIDAY, J. L., *Brit. J. Med. Psychol.*, 1943, **19**, 367.
Idem, *Psychosocial Medicine*, 1948, ch. 6, p. 111. London.
HEMPHILL, R. E., *J. Ment. Sci.*, 1941, **87**, 170.
Idem and MURPHY, B., Unpublished paper on Psychological Reactions associated with Pregnancy and Childbirth, 1951.
HERON, D., *A First Study of the Statistics of Insanity and the Inheritance of the Insane Diathesis*, 1907. London. Quoted by MacDermott (1908).
HOBHOUSE, S., and BROCKWAY, *English Prisons To-day*, 1922. London. Quoted by Faris (1934).
HUNTER, H. D., *Lancet*, 1949, i, 784.
HYDE, M. C., and CHISHOLM, R. M., *New Eng. J. Med.*, 1944, **231**, 612.
Idem and KINGSLEY, L. V., *ibid.*, 1944*a*, **231**, 543.
Iidem, *ibid.*, 1944*b*, **231**, 571.
INGHAM, H. V., *Amer. J. Psychiat.*, 1949, **106**, 98.
KALLMANN, F. J., *J. Ment. Sci.*, 1948, **94**, 250.
KLEIN, M., *Contributions to Psychoanalysis*, 1950, p. 339. London.
KROUT, M. H., *Am. Sociol. Rev.*, 1938, **3**, 209.
LANCET, 1950, ii, 919. Annotation.
LINE, W., *Brit. J. Med. Psychol.*, 1951, **24**, 42.
MACCURDY, J. T., Lectures in Abnormal Psychology, delivered at the University of Cambridge, 1939.
Idem, *Brit. J. Psychol.*, 1950*a*, **40**, 99.
Idem, *ibid.*, 1950*b*, **40**, 175.
MACDERMOTT, W. R., *Brit. Med. J.*, 1908, ii, 950.
MALAMUD, W., and MALAMUD, I., *Psychosomat. Med.*, 1943, **5**, 364.
MALINOWSKI, B., *Sex and Repression in Savage Society*, 1927. London.
MALZBERG, B., *Psychiat. Quart.*, 1943, **17**, 488.
MEAD, M., *Male and Female*, 1949, ch. 15,p. 306. New York.
MEYER, A., *J. Ment. Sci.*, 1933, **79**, 435.
MICHAELS, J. J., *J. Nerv. and Ment. Dis.*, 1947, **106**, 165.
MILLER, E., *Brit. J. Med. Psychol.*, 1950, **23**, 213.
MUMFORD, L., *The Culture of Cities*, 1938, ch. VII, p. 486 ff. London.
PARK, R. E., *Am. J. Sociol.*, 1936, **42**, 1.
PARNELL, R. W., *Lancet*, 1951, i, 731.
PEARSE, I. H., and CROCKER, L. H., *The Peckham Experiment*, 1943, ch. 14. London.
PEMBERTON, J., *Lancet*, i, 1951, 224.
POST, F., *Brit. Med. J.*, 1951, ii, 436.
PRICHARD, J. C., *A Treatise on Insanity and Other Disorders of the Mind*, 1835, ch. 10, p. 336.
REES, J. R., *Am. J. Psychiat.*, 1950, **107**, 81.
REID, D. D., *Brit. J. Soc. Med.*, 1948, **2**, 123.
RODGER, T. F., *International Congress on Mental Health, London*, 1948, vol. IV, p. 213 ff.
RUBE, P., *J. Nerv. Ment. Dis.*, 1948, **108**, 304.
SELIGMAN, C. G., *Brit. J. Med. Psychol.*, 1929, **9**, 187.
SHELDON, J. H., *The Social History of Old Age*, 1948. London.
SHULMAN, A. J., *Psychiat. Quart.*, 1950, **24**, 515.
SOROKIN, P. A., and ZIMMERMAN, C. C., *Principles of Rural-Urban Sociology, New York*, 1929. Quoted by Hyde and Chisholm (1944).
SOLOMAN, H. C., *Digest Neurol. Psychiat.*, 1950, **18**, 635.
STARK, J., *J. Stat. Soc., London*, 1851, **14**, 49.
Idem, *ibid.*, 1852, **15**, 250.

STOCKS, P., *Sickness in the Population of England and Wales in* 1944–1947, 1949. London : H.M. Stationery Office.
STROMGREN, E., *J. Ment. Sci.*, 1948, **94**, 266
SYMONDS, C. P., *Brit. Med. J.*, 1943, ii, 703 and 740.
TOYNBEE, A. J , *A Study of History*, 1934, vol. IV. London.
TUKE, D. H., *Insanity in Ancient and Modern Life*, 1878.
TYHURST, L., *Am. J. Psychiat.*, 1951, **107**, 561.
VAN LOON, F. H. G., *J. Abn. Psychol.*, 1927, **21**, 434.
WHITE, L. E., *Small Towns*, 1951. London : National Council of Social Service.
WHITE, W. A., *J. Nerv. Ment. Dis.*, 1903, **30**, 257.

APPENDIX (see p. 589).

The patient was a married woman, aged 26, admitted on account of a mild puerperal psychosis. She had been well until the birth of her first baby a fortnight before admission. There was no family history of instability and her previous personality was sound although she was always inclined to be anxious. Three years before her marriage she had an affair with a man and feared she had acquired venereal disease, though the tests were negative. During pregnancy she remained very well. Her labour was uncomplicated and her infant, though slightly underweight at birth, was full-term. She attributed her illness to her experiences in the maternity hospital.

On arrival at that hospital, she was put in a waiting-room, where she remained for more than an hour, and it was not until her husband rang to enquire how she was getting on that her presence was remembered and she was taken to the ward. She was put next to a woman who said she had been in labour for nineteen hours and was suffering terribly. All the nurses seemed to be in a great hurry. They said to her, " Don't have your baby yet, we're not ready for it." She could hear screams coming from the labour room and one woman was howling and crying in a hysterical manner. When she was on the labour bed, a nurse kept listening for the baby's heart-beat and seemed to be very worried about it. After the baby was born, a nurse said, " It's a girl," but shortly afterwards another said, " No, it's a boy." Next day a nurse said her breasts were terribly swollen and that something must be done about them because of misshapen nipples. The baby did not feed well at first, and a woman in the next bed, who had said she had not wanted her own baby, kept telling her she was doing it all wrong and would kill the child if she was not careful. A woman in the next ward, whose baby had died, had a blood-group card of the same colour as her own, and this worried her as she knew about the Rhesus factor. Moreover, there were printed cards bearing the patients' names on the doors, and while most of these names were in black type, some were in red ; it was generally supposed by the patients that red cards were used to indicate the serious or complicated cases. The patient's own card was in red. She wanted to tell the doctor about her fear of having passed syphilis on to the child, but there was no privacy. There was a continual noise and banging of doors in the ward. She could hear the nurses talking under her window about the patients in the hospital. Voices echoed up and down the corridor and she gradually came to believe that her name was being mentioned by everyone. She became confused and felt she was being " driven out of her mind " by all these worries. According to the ward report, " she says she heard the nurses talking about her baby, saying it had a disease. She told the ward sister that she had syphilis and that the baby was infected. She is unstable and has delusions of persecution and guilt."

On admission to the psychiatric hospital she was emotionally labile but did not appear to be hallucinated. Although over-talkative, she was rational and gave a clear account of herself. The noisy patients in the admission ward frightened her, and she discharged herself against advice on the fourth day. Subsequent reports indicated that she made good progress and recovered uneventfully at home.

Comment.—This history suggests that factors in the environment of the maternity hospital played a part in precipitating the patient's psychosis, and that of these factors, the sense of isolation—of having no one to confide in and of feeling different from the others—was the most important. It is interesting that the patient had never been in hospital before and had therefore had no opportunity of becoming accustomed to the peculiar social climate of a hospital ward.

NARCOLEPSY: A BRIEF CRITICAL REVIEW AND STUDY OF EIGHT CASES.*

By D. A. Pond, M.D., M.R.C.P., D.P.M.

Senior Lecturer Department of Clinical Neurophysiology, Institute of Psychiatry, The Maudsley Hospital, London.

I. Clinical and Physiological Studies.

Most of the classical reviews of narcolepsy were written in the decade from 1925 (Kinnier Wilson, 1928; Redlich, 1931; Thiele and Bernhardt, 1933; Daniels, 1934, and others). The clinical picture was well established by these writers and does not need discussion. In addition to narcoleptic seizures, other symptoms are common, the most frequent being attacks of loss of tone and power, variously called cataplexy, "Lachschlag," "Tonusverlust." Night sleep is often disturbed by periods of wakefulness and bad dreams. During the phases of going to sleep or waking up, temporary paralysis of the muscles, without disturbance of consciousness, and hallucinatory episodes of all sense modalities sometimes occur. The generally accepted explanation of these various phenomena is that they represent a dissociation of the motor, sensory and central components of sleep. There are, however, three controversial points: firstly, the relationship of the patho-physiology of the seizures to epilepsy; secondly, the "somatic constitution" of the narcoleptic patient; and thirdly, the nosological status of narcolepsy.

Wilson (1928) supported a relationship between epilepsy and narcolepsy. He noted the following common points of narcoleptic and epileptic attacks: the periodical recurrence, the abrupt onset with or without aura, the diminution of consciousness, the relatively brief duration and freshness afterwards. Since, however, most of these characteristics are shared by some other periodic physiological events, e.g., a sneeze, this argument by analogy is unconvincing. There are a number of E.E.G. reports which appear conflicting at first sight. Blake, Gerard and Kleitman (1939), Janzen (1939) and Hess (1949) all find normal records with normal sleep patterns. Seventeen of Dynes and Finley's (1941) twenty-two cases had normal records. The illustrations of the other five records, claimed as abnormal, hardly bear out their contention. In at least one case the abnormal activity is probably due to muscle artefact, and the abnormalities in the others are compatible with early sleep drift. Cohn and Cruvant (1944) published the E.E.G.'s of ten cases, which they claim, support a connection between epilepsy and narcolepsy. Again, however, a critical study of their illustrations throws doubt on this. Some of the records show only slow, or fast and slow, activity, which are non-specific abnormalities not necessarily indicative of epilepsy. Two records had spikes, but in both cases the appearances of the illustrations are more typical of artefact. Only one case, which was also unusual clinically, showed a focal cortical abnormality. There is only one case in the literature (Roth, 1946) in which specific spike and wave complexes are claimed. All authors are agreed that, during actual narcoleptic seizures, the E.E.G. is indistinguishable from that obtained in normal sleep.

In few attacks of cataplexy has the E.E.G. been recorded. Hess (1949) found the E.E.G. unchanged in an attack, whereas Janzen and Behnsen (1940) found sleep patterns. Natter and Gastaut (1950), discussing "epileptic cataplexy," point out that the sudden dropping attacks which occur in epileptics, and have sometimes been called cataplectic, are more likely to be due, not to loss of muscle tone, but to a generalized myoclonic jerk, pulling the patient to the ground.

The problem of the somatic constitution of the narcoleptic patients including the various forms of body-build and changes in the endocrine and autonomic nervous systems, has received attention, mainly in the older German literature. Thiele and Bernhardt (1933) regard it as one of the cardinal symptoms of the condition. Pyknic and athletic types of body-build are more common than leptosomes. The patients often have a heavy eunuchoid appearance, and there is usually a history of increase of weight at the time of onset of illness. Some patients have small external genitalia and poorly developed secondary sex characteristics. The great excess of male over female patients and the common disappearance of libido and potency also suggest a probable relationship to the sex hormones. The basal metabolic rate has been recorded on numerous patients, and Table I shows the values obtained in 36 cases collected mainly from authors publishing long series of cases (Cohn and Cruvant, 1944; Drake, 1949; Levin, 1929; Rosenthal, 1928, and Thiele and Bernhardt, 1933). Boothby *et al.* (1936) have published a large series of B.M.R.'s on normal subjects. They show that the P value of 0·05 (one chance in 20) is at B.M.R. ± 11 and P 0·01 (one chance in 100) is at B.M.R. ± 15. Dividing the cases obtained from the literature at these points shows that narcoleptics as a group have a marked skew distribution of B.M.R., the average being below normal. A relative lymphocytosis has often been alleged, but the average counts of cases published in the literature do not differ significantly from the figures of Mainland *et al.* (1935) obtained from a comparable normal group.

---

* Abstracted from a thesis for the degree of M.D.Cantab. in which full experimental details and case-histories are reported.

The theoretical basis of these studies is the idea of vagotonia, first described in detail by Eppinger and Hess (1915). Such signs as miosis, hypothermia, bradycardia, sinus arrhythmia, hypoglycaemia and excessive salivation and lacrimation are regarded as evidence of a preponderating parasympathetic activity. Unfortunately this idea has never had the benefit of refined statistical analysis such as is now being applied to somato-typing. Only the recent monograph of Wenger (1948) provides any statistically analysed data. Although the correlations were mostly in the expected direction, none was significant. It has been claimed that further evidence can be obtained by the injection of drugs with activity related to the autonomic nervous system, e.g., adrenalin, atropine, pilocarpine and ergot. Again, however, no statistically satisfactory work has been done, and in a recent critical review Dechaume (1949) considers the interpretation of drug effect difficult. Hofmeister (1948) investigated the effects of these drugs on the pulse, blood pressure and clinical state of six narcoleptics, but, unfortunately, included no normal controls.

There are certain other interesting observations in the literature; for example, Daniels (1934) noted polyuria and polydipsia in a few patients. Richter (1929) showed that the skin resistance of narcoleptics was much higher than normal and showed frequent large fluctuations.

Magnussen (1943) extended to three narcoleptic patients observations on the diurnal variations in skin temperature of the feet similar to those he had made in 1939 on normal subjects. Before both sleep and narcoleptic seizures there was a rise in skin temperature which Magnussen called "vegetative sleep preparedness." Kleitman (1949) criticizes this work on the grounds that the combined effects of meals and muscular relaxation could explain the normal diurnal variations in skin temperature, but this criticism would not apply to the studies on the narcoleptics.

The problem of the aetiology and pathogenesis of narcolepsy has a resemblance to that of epilepsy. Narcolepsy can occur either from a variety of pathological conditions affecting mainly the hypothalamus and mid-brain, or in patients without any evidence for such a lesion. Wilson, therefore, speaks of *the* narcolep*sies*, as well as the epilepsies. This has the advantage of stressing that narcolepsy is a symptom, not a nosological entity, but it obscures the fact that the physiological changes in the actual attacks are identical, whatever the aetiology. Furthermore, the various associated symptoms, such as cataplexy, may or may not occur, irrespective of the aetiology. No symptom-picture corresponds to a particular cause. It is expedient, therefore, to separate the pathophysiological mechanisms in narcoleptic attacks from the aetiological factors producing the whole clinical picture, and to recognize the existence of "idiopathic" and acquired narcolepsy, unsatisfactory as this may be.

Krabbe and Magnussen (1942) have collected no less than 54 cases of familial narcolepsy from the literature. In a family of Hoff and Stengel's (1931) one case was postencephalitic and another apparently of "idiopathic" origin. Furthermore, in several other cases, some other members of the family suffered from "neurotic" sleep disturbances. Such observations form the basis of the mainly German concept of an "anlagefaktor" or "narkolepsiesubstrat" underlying all forms of narcolepsy irrespective of aetiology.

Personal Observations.

The following physiological studies were chosen in an attempt to answer the controversial points in the literature already discussed. Brief histories of the eight cases on which they are based are at the end of the paper. Six had histories typical of "idiopathic" narcolepsy, one was definitely postencephalitic and another of late onset, possibly arteriosclerotic in origin. Only Case 8, the post-encephalitic, had definite clinical neurological signs. The routine temperature and respiration rates showed no significant difference from those of a group of twenty control patients taken under the same conditions. The average pulse-rate was slightly lower (68 compared with 77). The blood-cell counts and blood cholesterol levels were normal. Table I shows the B.M.R. values, the average of which was −11. The B.M.R. of the postencephalitic narcoleptic was the lowest of the whole group (−16).

TABLE I.

B.M.R.	15+.	+15– +11.	+11–0.	0– –11.	–11– –15.	–15–.
No. of cases in literature . . .	2	1	7	14	4	8
Own cases . .	—	—	2	2	3	1

All the male patients had black or greying hair and sallow complexions, and the young ones were rather obese, but the female patients had a less uniform physical appearance. Sinus arrhythmia was investigated by measuring the intervals between the heartbeats, using an E.E.G. channel to record the E.C.G. The subjects took long slow breaths of timed ten-second periods each of inspiration and expiration. The average difference between the heart rate on inspiration (80/min.) and expiration (55/min.) was more than that of a control group of fourteen normal subjects of similar average age (90 and 70/min.), but the scatter was wide and the difference not statistically significant. Three patients complained paradoxically of a dry mouth, (1, 4 and 5) a symptom which may be regarded as evidence of decreased rather than increased parasympathetic tone. Two patients had a mild polydipsia.

The effects of intramuscular atropine (0·5 mgm.), adrenaline (1 c.c. 1 : 1000 solution) and pilocarpine (5 mgm.) were investigated in five patients and three controls of comparable age and physique. The pulse-rate was recorded on one channel of E.E.G., regular readings taken of the blood pressure and any clinical changes noted for a period of one hour. The curves were closely similar, and there is no evidence of an increased effect of atropine and decreased effect of adrenalin in narcoleptics, as might be expected from the hypothesis of vagotonia. The paradoxical early effect of atropine in both normals and patients in lowering the pulse-rate and inducing a period of sleep is noteworthy.

Numerous E.E.G. records were taken. The standard records, using a 15 electrode bipolar technique in routine use in the laboratory, showed normal records in most cases, with frequent "drifts" into a fast and slow dominant picture typical of early sleep. Only Case 8 had a record definitely suggestive of any acquired organic condition, by reason of the frequency instability of the dominant alpha rhythm. The response to overbreathing in this case was also grossly abnormal; that of Case 7 was mildly so, and the rest were stable. Case 1 had an interesting anomaly, not so far reported in narcolepsy, in that the dominant 8 c/s alpha was mixed with 3–3½ c/s activity, which was maximal in the posterior regions and blocked with eye opening. A record taken of his father showed a similar abnormality. Furthermore, both patient and father showed sharp waves from a single electrode inserted into the pharynx. As such a lead is "electrically equidistant" from the temporal poles, frontal orbital region and the brain-stem, the origin of these sharp waves cannot be definitely determined. Such basal recordings from the other narcoleptics often gave prominence to the slow activity seen bilaterally synchronously at the vault electrodes, but showed no new features such as in Case 1.

The sleep periods recorded in nearly all patients were quite normal in their E.E.G. patterns. On a number of occasions the electrocardiogram was recorded simultaneously, and the observations of Bjerner (1949) on normal, sleep-deprived subjects confirmed. Fig. 1 shows short and sudden sequences of sleep patterns in the E.E.G., occurring simultaneously with a slowing of the heart-rate. These observations strongly suggest that there is a central "sleep centre" able to exert an influence both upwards and downwards. The same deduction may be made from Magnussen's

(1944) studies on respiration in sleep, in which he showed that very brief periods of sleep are associated with a simultaneous change from awake to sleep patterns of breathing. That simultaneous E.E.G. and pulse changes occur in narcolepsy further supports the essential normality of narcoleptic sleep. Case 4 showed two interesting attacks, in which he appeared conscious, but unable to move to command. He was drowsy at the time, and the E.E.G. pattern of early sleep drift was essentially unchanged during the attack, which was presumably in the nature of sleep paralysis (Fig. 2).

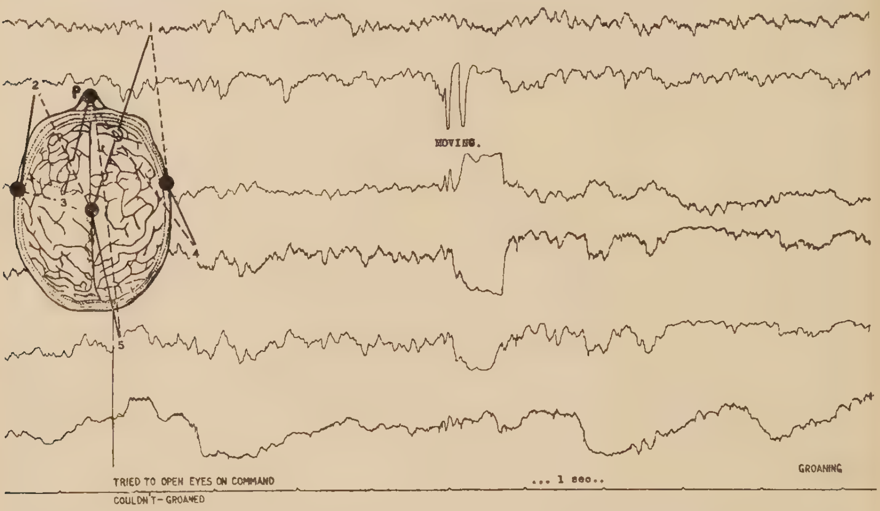


FIG. 1.—Case 5, showing arousal from a period of drowsiness with appearance of alpha rhythm and a simultaneous increase in heart rate. (Channel 6 E.C.G.). (P is lead in nasopharynx.)

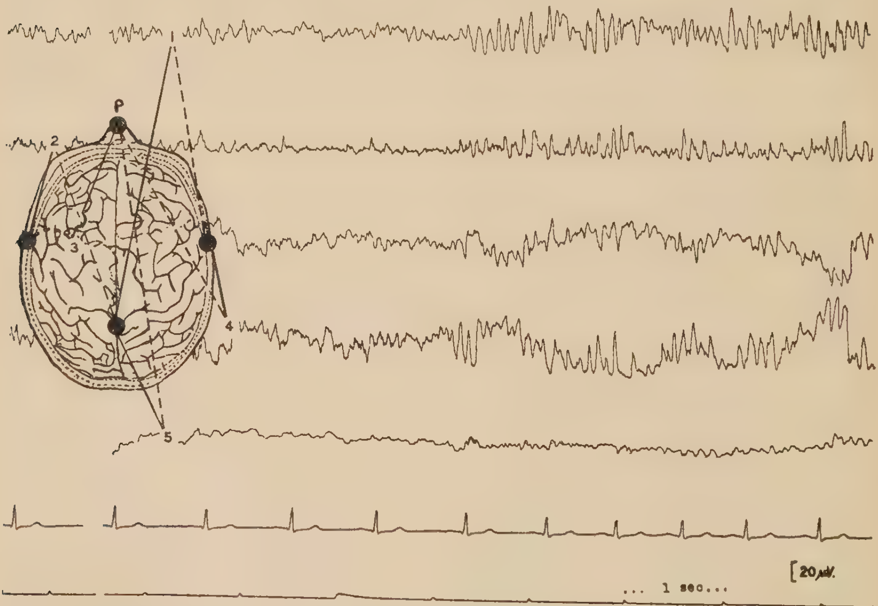


FIG. 2.—Case 4 : Attack of partial temporary paralysis during a period of drowsiness, probably in the nature of sleep paralysis. Note that the sleep patterns in the E.E.G. are essentially unchanged. (Channel 6 is recording eye movements from electrodes placed across the orbit. P is lead in nasopharynx.)

The metrazol threshold was determined in seven of the patients using the Gastaut (1950) technique. It was normal in three (more than 4 c.c.), doubtful in one, and low in three (less than 3 c.c.). The interpretation of this test is as yet unclear, as low thresholds are by no means confined to epileptics, being also seen in some hysterics and schizophrenics. The effects of photic stimulation without metrazol were quite normal in these patients.

In summary, these investigations showed only doubtful evidence for the presence of a vagotonic condition. A low average B.M.R. was the most notable metabolic abnormality. The patterns of sleep seem to be identical in normal subjects and in narcoleptic patients, irrespective of aetiology. No evidence for epilepsy was obtained.

2. Psychological and Psychopathological Studies.

A much smaller and generally more recent number of papers has been written on narcolepsy by psychiatrists interested in the mental rather than physiological aspects. Only one case—and that the earliest by some years—was completely psycho-analysed, with a satisfactory therapeutic outcome (Missriegler, 1924, rendered into English by Karpman, 1941). Missriegler is careful to point out that, in spite of the psychological significance of the narcoleptic attacks, the aetiology may well have been post-encephalitic. The narcoleptic seizures apparently allowed the patient to experience in phantasy polymorphous sexual impulses which were traceable to the early oedipal situation. In 1944 Langworthy and Betz revived interest in the psychopathological aspects by the publication of six cases. They considered the narcoleptic syndrome to be allied to the hysterical reaction—" a type of response under emotional conflict usually engendered by the patient being caught up in a life pattern to which they conform but deeply resent." Further cases were published by Spiegel and Oberndorf (1946), Coodley (1948), Drake (1949), and Barker (1948). The last author made some interesting experiments recording the E.E.G. during psychotherapeutic sessions under a small dose of amytal. He claimed that when emotionally disturbing material was being approached, the patient went to sleep with accompanying appropriate E.E.G. changes. His interpretation that it is a defence mechanism is similar to that of Langworthy and Betz. The same claim was made for the isolated symptom of sleep paralysis seen in serving soldiers by v.d. Heide and Weinberg (1945) and Schneck (1948). In none of these cases has any detailed general personality study been made. Only Drake (1949) mentions the results of special psychological tests. In most cases there is clear evidence of an emotionally disturbing early environment, and the frequency of sexual disorders is noteworthy. The sketchiness of the reports precludes any further generalizations. Of the neurologists only Thiele and Bernhardt comment on the personalities of the patients, considering that they have in common a certain stolidity and phlegm, " Pomadigkeit " or " Dickfalligkeit."

There have been a few reports of psychotic episodes occurring in association with narcolepsy (one case of Thiele and Bernhardt's series of 30, and one case each by Locke and Bailey (1940), Brock and Weisel (1941), Lehrman and Weiss (1943) and Drake (1949)). All the psychoses were schizophrenic in character, hallucinations and delusions being prominent.

Levin (1933, 1934, 1935 and 1950) and Fabing (1946) have analysed the narcolepsy syndrome in Pavlovian terms. Such terms have a deceptive simplicity and an appearance of explaining everything, but as Pavlov's later work shows, more and more *ad hoc* hypotheses have to be invented to cover the facts. Little is gained from his terminology, which does not completely bridge the gap between psychology and neurology.

Personal Observations.

In all cases the diagnosis of narcolepsy had been made previously by neurologists. The patients were admitted for special study and full psychiatric histories were obtained. In addition, intelligence tests were done on all (Table II), and the Rorschach on all except Case 4. These studies show that the narcoleptics have many resemblances in their personalities and backgrounds. The homes of all were emotionally disturbing, some grossly so (e.g., Cases 1, 2 and 7), but none of the patients showed any overt neurotic traits or behaviour disorders. The intelligence levels of all were above average, some (e.g., Cases 3, 6, 7 and 8) being far above their employment positions. There was no abnormal scatter of scores in the subtests.

TABLE II.—*Intelligence Tests.*

Case No.	1	2	3	4	5	6	7	8
Wechsler verbal	124*	105	141	106	111	117	129	130
Wechsler performance	—	110	126	111	121	102	121	119
Wechsler full scale	—	108	137	109	117	112	127	126

* Mill Hill Vocabulary Test.

Most of them showed an interest in politics, religion and artistic matters commensurate with their intelligence, although in this, as in so many other aspects of their characters, a passivity or emotional flatness was noted. Only Case 1 had had sufficient drive to reach a position socially and in employment of which his capacities were worthy. Sexual maladjustment was obvious in all those who were married; all four of the married men suffered from ejaculatio praecox, and Case 2, the only married woman, was frigid. In the men the oedipal situation was similar, all of them being identified with their passive mothers, taking their part against the strict fathers, who were frequently violent and alcoholic (Cases 1, 4, 5 and 7).

Although laughter is the commonest emotional state inducing cataplectic seizures, other interesting conditions were mentioned by several of the patients. Case 1, a laboratory technician, found that seizures occurred when he was about to bring off a demonstration to students. Case 5 said, " If I get a bull at darts I can hardly walk to the board." Case 7 similarly had difficulty in making winning moves at any game. He also had attacks of weakness and shakiness at the orgasm, as Rothfeld (1932) has described. The Freudian theory of laughter is that it is a socially acceptable form of aggression, and it appears that psychologically comparable situations of conspicuous self-assertion may act as triggers to cataplexy, the symptom in itself effectively frustrating the intended act.

The Rorschach tests were independently scored by two psychologists. The group as a whole give a comparatively small number of responses (except Case 8). The percentage of F and F + responses was high, but there were few M and A ones, none being very unusual. There was no consistent experience-type. There were no K responses, and only Case 1 gave a crude colour response. The common features, therefore, were mainly indicative of a colourless, restricted emotional life, and obsessional trends without tension. The little overt anxiety present was mainly related to sexuality. It is of interest that the post-encephalitic resembled the other patients in many of these traits, though he had more aggressivity. These observations confirm the clinical data, and the traits outlined are reminiscent of Thiele and Bernhardt's word " Pomadigkeit."

DISCUSSION.

The name narcolepsy is unfortunate, not only because it suggests unjustifiable associations with epilepsy, but also because it accentuates the sleep attacks with relative neglect of the many other clinical phenomena shown by the majority of patients with narcoleptic seizures. Sleep is a complex physiological phenomenon with changes in all spheres of bodily activity. Although alternating cycles of rest and activity are seen in the simplest animals, the higher animals have a central co-ordinating mechanism imposing regular sleep and wakefulness upon the whole organism. It is this central co-ordination which appears to be disturbed in narcolepsy in ways which may be compared superficially with the varieties of seizure an epileptic patient may have at different times: for example, myoclonic jerks (cf. the cataplectic attack), a sensory aura (cf. sleep hallucinosis), or a major seizure (cf. a full sleep attack). The character of the seizures depends on the site of origin of the discharge and its direction of spread; in the case of epilepsy there is an abnormal excessive excitation which is spreading, whereas in the narcoleptic it is a normal " inhibitory " process of unknown character, and this is the crucial point at which the analogy breaks down, as Levin (1950) has pointed out. At the present time the biochemical changes which increase excitability of neurones and are therefore possibly the fundamental patho-physiological abnormality of epilepsy are of increasing interest. In the same way the studies of narcolepsy suggest a metabolic factor decreasing excitability—for example, the low B.M.R.

The presence of both physiological and psychological changes in one and the same patient shows that it is untenable to divide narcolepsy into " organic " and " psychogenic." Also, the personality studies of narcoleptics show facts inexplicable in terms of a "reaction" to stress, and in the same way an explanation of the attacks as a "defence mechanism" is quite superficial. Many of their symptoms can be studied profitably from both psychological and physiological points of view. Ejaculatio praecox, for example, may be seen as a disturbance of central autonomic regulations on the one hand. On the other hand there are interesting personality resemblances between narcoleptics and the patients with ejaculatio praecox described in Karl Abraham's (1927) classical study. They are very narcissistic, without energy, and passive, especially in relation to women, being permanently dependent on their mothers. The cataplectic attack appears to be "utilized" for purposes comprehensible psychologically, and the emotional passivity of these patients, in spite of their disturbing backgrounds, may be related to the "use" sleep may have, in Missriegler's sense. Also the patients can regard the symptoms as respectable and organic, acceptable to their high intelligence and rather rigid standards. Such explanations, however, do little toward the understanding of the psychosomatic relationship. It appears that there is a deeper relationship in that the pathophysiological abnormality (the "narkolepsiesubstrat") underlies both the tendency to seizures and in part determines the personality structure.

Neuropathological studies of sleep disorders have pointed to the third ventricle and midbrain regions as being the site of a "sleep centre." Recent neurophysiological studies of the non-specific reticular substance in this region shows it to be of great importace in the maintenance of the awake or aroused patterns of the electrical activity of the cerebral cortex (see, e.g., Magoun, 1950). At lower levels reticular substance is concerned with the distribution of excitation and inhibition in motor responses (Magoun and Rhines, 1946; Sprague *et al.*, 1948), and at the hypothalamic level it can affect vasomotor activity (Thompson and Bach, 1950). To impute to these regions, therefore, a sleep-centre is to name only part of their function, which is more graded and concerned with "attention" generally. To get away from the too narrow associations of "attention" with conscious control, it would seem better to revive Head's old term "vigilance," which expresses so well combined motor, sensory and autonomic "attention." To study narcolepsy as a disorder of vigilance would seem a step in elucidating its real pathophysiology.

SUMMARY.

Physiological, psychological and psychopathological studies of eight cases of narcolepsy were made. The controversial points in the previous literature were discussed. No evidence for an epileptic basis to the narcoleptic seizures was obtained, which seemed identical with normal sleep, irrespective of aetiology of the narcolepsy. Doubtful evidence of the presence of excess "vagotonia" was obtained. Personality studies suggested certain common character traits in these subjects and the psychological significance of the attacks was discussed.

The majority of the cases were referred from King's College Hospital, to whose Physicians (especially Drs. Macdonald Critchley and S. Nevin) I am indebted. Case 8 was under the care of Dr. E. Stengel. My thanks are due to Mrs. F. Talland, of the Department of Psychology at the Institute of Psychiatry, for doing most of the psychological tests.

SUMMARIES OF CASE HISTORIES.

CASE 1.—D. B—, a 27-year-old married man, had a disturbed family background resulting from his father's unstable, violent and alcoholic temperament. The father also alleged he suffered from narcolepsy as a soldier in the 1914–18 war. His mother was a passive, retiring woman, and his only brother, the father's favourite, showed psychopathic traits. A maternal aunt played a great part in the patient's upbringing. The birth was difficult, but development normal. As a child he showed many neurotic traits but did quite well at school, and his employment record was also very satisfactory. He had been delirious on one or two occasions with illnesses such as measles, but there was no definite history of an encephalitis. He had been married some three years after a number of casual affairs, and he suffered from occasional ejaculatio praecox. Narcolepsy and then cataplexy and sleep paralysis began insidiously during his late school years, and he had a number of other symptoms, some of them possibly of a hysterical character. When seen two years later in out-patients there was little change, though he had put on more weight in spite of large doses of amphetamine. The Rorschach showed fairly well-controlled anxiety, especially in the sexual sphere. The precision was high, the content stereotyped (72 per cent. A, 20 per cent. Pop.).

CASE 2.—E. M. C—, a 40-year-old married woman, had a very bad family history of psychoses in her mother, grandmother and numerous other relations. Her early environment was very disturbed by her mother's mental illness and her father's alcoholism and promiscuity. In spite of this she appeared to have had a normal development and suffered only from nightmares as a child. She had an average school record, and worked well as a dressmaker until her marriage fifteen years ago. This was somewhat unhappy by reason of the inadequacies of her husband, whom she married "on the rebound." They had one normal son. There were considerable sexual disturbances, but a fair general social adaptation. She had had no serious illnesses. There were no obvious precipitating causes for her present illness, which began insidiously in adolescence. She had a mild polydipsia in addition to the usual symptoms. In temperament she was very placid, easy-going and unambitious. There was little change when she was seen again a year later in out-patients. She was reluctant to become a "slave to amphetamine." The Rorschach record was short (R 21) and the content stereotyped (71 per cent A). There was evidence of emotional inhibition especially in the sexual sphere.

CASE 3.—J. M. F—, aged 22, was an only child of restricted middle-class background. Both parents had somatic anxiety symptoms, especially in relation to sexuality. She had a normal birth and development and did very well at school, although this was broken up by evacuation and she never matriculated. She has worked steadily at engineering drawing since. The onset of narcolepsy and cataplexy was insidious while she was at school. In personality she was a neat, precise but narcissistic individual with few emotional and social outlets; she seemed content to put up with things as they were, and her only passions in life were clothes and dressmaking. There was little change over the year that she was followed in out-patients since the original investigations. The Rorschach record was short (R 20) with stereotyped imagery (60 per cent. A) and very good form (F + 92 per cent.). The affectivity was rather flat, especially in the sexual sphere.

CASE 4.—H. H. H—, 23-year-old man, was the son of an ex-regular Army officer described as an irritable disciplinarian. His mother was a quiet, ineffectual person, adored by the patient. Birth and early development were normal, and his only serious illness was mild tuberculosis of the lung discovered on joining the R.A.F. Schooling was broken up by the family's moves from barrack to barrack, but he liked it and did quite well. He worked in an engineering drawing office. Narcolepsy and cataplexy began insidiously in adolescence. Very marked sleep hallucinations led to a period of interest in spiritualism, and he still tended to doubt the imaginary character of his experiences. In personality he was earnest, quiet and meticulous. He had a mild affair with a girl friend but never had sexual intercourse.

CASE 5.—F. M— was a 48-year-old man of Yorkshire mining background. Father was alcoholic and bad-tempered, and the patient was very attached to his placid mother. One brother was discharged from the Army with "funny turns." The patient seemed to have had a normal birth and development. He did well at school and had no serious illnesses. His employment was much broken during the depression. He was for a while in the regular Army, but bought his discharge to get married. Narcolepsy and cataplexy began at the age of about 44. At the beginning of this time he put on a stone in weight, and his wife thought there had been some personality change with an increase in irritability. He himself complained of failing memory. In personality he had always been a very retiring submissive, passive individual of high moral standards. His wife was much older than he, and managed him like a mother. He was sexually not very active and had occasional ejaculatio praecox. No evidence was obtained of any organic disorder, and over the past year there has been no change in his condition. The Rorschach test showed rather slow responsiveness (Av. R.T. 52″, Av. T. per R. 95″); it was not as rich as might be expected from his I.Q. level. There was little affectivity, and the animal responses were of non-aggressive type.

CASE 6.—M. M. M—, aged 58, a spinster, was a professional musician whose family background was of middle-class Dublin society. Her mother was an eccentric woman, the dominant partner of the marriage, who idolized the patient, a feeling that was not reciprocated. Birth and early development were presumably normal, and she suffered from no serious illnesses. Her education was by governesses and she learned little outside music, the study of which she pursued in Vienna and Berlin up to the outbreak of the 1914–18 war. Since then she had made a precarious living as a professional violinist. The present illness began at age 28. In personality she was a reticent, passive and rather eccentric woman, who lived a very solitary life. She had had only mild love affairs and remained a *virgo intacta*. She was an ardent Roman Catholic and fond of arguing politics. The Rorschach gave evidence of high but undisciplined very personal intelligence. The imaginal life was rich but there were no colour responses. Shading responses and the many unpleasant or evil images were evidence of anxiety.

CASE 7.—B. G. M—, aged 26, was the son of an ex-regular Army sergeant, later captain, who was an alcoholic, promiscuous and aggressive man. Mother was an anxious woman who suffered from numerous somatic complaints, but put up with the father without much resentment. There was a number of siblings, all the sons leaving home early to join the Army. The one sister was an unstable individual divorced by her husband for infidelity. The patient's birth and development were normal, but the family situation was disturbed owing to their moving from barrack to barrack. Nevertheless he did well at school, which he left at 14 to join the Army. He saw service abroad as a clerk, but was invalided out with narcolepsy. Since then his work record has not been good, and his jobs were well below his intellectual capacities. As an adolescent he was involved in a few minor homosexual adventures and then established a liaison for a while with an older married woman. He married a cousin a few months before he was first seen, after a period of indecision between marriage and entering a religious order. The marriage seemed a happy one. His present illness began at about the age of 20, and he used to have fears of V.D. causing his symptoms. Sometimes he had an emission in narcoleptic attacks, and cataplectic symptoms at the orgasm. In personality he was a passive, dependent, meticulous individual, who seemed to have made a satisfactory resolution of his personal problems in a religious conversion. His sexuality showed a marked passive homosexual trend, which was confirmed in his dreams. The Rorschach was a short (21 R) constricted record with obsessional features. The aggressive tendencies were carefully controlled but psychosexual problems were prominent.

Case 8.—M. W. H. S—, aged 43, was a married man of Irish parentage. His father was a very strict, short-tempered man, and his mother always ailing. There were frequent parental quarrels. As a child he was normal in development, but was "highly strung." He did well at school and worked steadily in an office position with a break during the war as a Corporal in the R.A.F. He has been married 16 years to a wife who is the dominant character. Since the birth of children there has been gradual deterioration in marital relationship and intercourse has become rare. His present illness was probably related to an episode 25 years ago diagnosed as "cerebral 'flu," but there have been no mental symptoms of note until after the war. He became extremely irritable and depressed and developed peculiar habits of hoarding. Narcoleptic seizures began 3 years ago. He has had no cataplexy or other sleep symptoms, but has suffered from attacks of diplopia. He was a dependent, reserved, very religious and obsessional individual. On physical examination his face was seen to be rather expressionless. Convergence was poor and there was diplopia on lateral deviation of the eyes to the right. Skull X-rays and lumbar puncture were normal. He improved greatly on amphetamine. The Rorschach showed no evidence of organic impairment. There were many obsessional features, some poverty of affect and no overt aggressive content.

Bibliography

Abraham, K., *Selected Papers on Psychoanalysis*, 1927, chapter 13. London: Hogarth Press.
Barker, W., *Ps.-som. Med.*, 1949, **10**, 193.
Bjerner, B., *Acta Physiologica Scand.*, 1949, **19**, Supplement 65.
Blake, H., Gerard, H. W., and Kleitman, N., *J. Neurophysiol.*, 1939, **2**, 48.
Boothby, W. M., Berkson, J., and Dunn, H. L., *Am. J. Physiol.*, 1936, **116**, 468.
Brock, S., and Weisel, B., *J. Nerv. Ment. Dis.*, 1941, **94**, 700.
Cohn, R., and Cruvant, B. A., *Arch. Neurol. Psychiat.*, 1944, **51**, 163.
Coodley, A., *Psychiat. Quart.*, 1948, **22**, 696.
Daniels, L. E., *Medicine*, 1934, **13**, 1.
Dechaume, J., "Affections du Sympathique" in *Traité de Médecine, Paris*, 1949, **16**, 942–953. Masson et Co.
Drake, F. R., *Am. J. Med. Sci.*, 1949, **218**, 101.
Dynes, J. B., and Finley, K. H., *Arch. Neurol. Psychiat.*, 1941, **46**, 598.
Eppinger, H., and Hess, L., Trans. in *Nerv. Ment. Dis. Monog.*, 1915, No. 20.
Fabing, H. D., *Arch. Neurol. Psychiat.*, 1946, **55**, 353.
Gastaut, H., *E.E.G. clin. Neurophysiol.*, 1950, **2**, 249.
v.d. Heide, C., and Weinberg, J., *Ps.-som. Med.*, 1945, **7**, 330.
Hess, R., *Arch. Psychiat. Nervenkh.*, 1949, **183**, 132.
Hess, W. R., *J. Physiologie*, 1949, **41**, 61A.
Hoff, H., and Stengel, E., *Klin. Woch.*, 1931, **10**, ii, 1300.
Hofmeister, M., *Schweiz. Arch. Neurol. Psychiat.*, 1948, **62**, 96.
Janzen, R., *Dtsch. Z. Nervenheilk*, 1939, **149**, 93.
Idem and Behnsen, G., *Arch. f. Psychiat.*, 1940, **111**, 178.
Kleitman, N., *Sleep and Wakefulness*, 1939, 1st ed. Chicago.
Idem, *Physiological Review*, 1949, **29**, 1.
Krabbe, E., and Magnussen, G., *Acta Psychiat. et Neur.*, 1942, **17**, 149.
Langworthy, O. R., and Betz, B. J., *Ps.-som. Med.*, 1944, **6**, 211.
Lehrman, S. R., and Weiss, E. J., *Psychiat. Quart.*, 1943, **17**, 135.
Levin, M., *Arch. Neurol. Psychiat.*, 1929, **22**, 1172.
Idem, *J. Neurol. Psychopath.* 1933, **14**, 1.

Idem, ibid., 1934, **15**, 60.
Idem, ibid., 1935, **16**, 140.
Idem, J. Nerv. Ment. Dis., 1950, **111**, 101.
LOCKE, W., and BAILEY, A. A., *Proc. Staff Meeting Mayo Clinic*, 1940, **15**, 491.
MAGNUSSEN, G., *Acta Psychiat. et Neur.*, 1939, **14**, 39.
Idem, ibid., 1943, **18**, 457.
Idem, Studies on the Respiration during Sleep, 1944. London: H. K. Lewis.
MAGOUN, H. W., *Physiol. Rev.*, 1950, **30**, 459.
Idem and RHINES, B., *J. Neurophysiol.*, 1946, **9**, 165.
MAINLAND, D., COADY, B. K., and JOSEPH, S., *Folia Haemat.*, 1935, **54**, 8.
MISSRIEGLER, A., *Fortschr. Sex. Wissenschaft u. Psychoanalyse*, 1924, **1**, 217. Trans. by Karpman, B., *J. Nerv. Ment. Dis.*, 1941, **93**, 141.
NATTER, S., and GASTAUT, H., *Rev. Neurol.*, 1950, **82**, 252.
REDLICH, E., *Z. ges. Neurol. Psychiat.*, 1931, **136**, 128.
RICHTER, C. P., *Arch. Neurol. Psychiat.*, 1929, **21**, 363.
ROSENTHAL, C., *Arch. Psychiat. Nervenkh.*, 1938, **84**, 120.
ROTH, N., *Bull. Menn. Clinic*, 1946, **10**, 160.
ROTHFELD, J., *Z. ges. Neurol. Psychiat.*, 1932, **138**, 704.
SCHNECK, J. M., *Psychiat. Quart.*, 1948, **22**, 462.
SPIEGEL, L. A., and OBERNDORF, C. P., *Ps.-som. Med.*, 1946, **8**, 28.
SPRAGUE, J. M., SCHREINER, L. K., LINDSLEY, D. B., and MAGOUN, H. W., *J. Neurophysiol.*, 1948, **11**, 501.
THIELE, R., and BERNHARDT, H., *Abhandlungen aus der Neur. u. Psych.*, 1933, **193**, 691.
THOMPSON, W. C., and BACH, L. M. N., *J. Neurophysiol.*, 1950, **13**, 455.
WENGER, M. A., *Comp. Psychol. Monog.*, 1948, **19**, No. 4 (sect. III).
WILSON, S. A. K., *Modern Problems in Neurology*, 1928, chapter 5. London.

EXPERIMENTAL STUDIES OF A PERCEPTUAL ANOMALY. II. CONFIRMATORY AND EXPLANATORY EXPERIMENTS.

By M. B. Shapiro, M.A.,
Psychological Department, Institute of Psychiatry,
Maudsley Hospital, London.

Contents.

	Page
A. Initial Experiments	605
B. Methodological Implications	607
C. The Experiment	607
(1) Procedure	607
(2) Results	609
(a) Confirmatory	609
(b) Explanatory	614
D. Discussion	615
E. Summary	616
F. Appendix : Block Design Rotation Test	616

A. Initial Experiments.

The first paper in this series described a number of experiments on a single subject, carried out to investigate an anomaly observed during performance of the Kohs Blocks test. This anomaly consisted of making the model correctly but rotated. (Illustration 1.)

The first hypothesis adopted to explain this observation was that anomalies of perception are functions of disturbed figure-ground relations (Goldstein and Scheerer, 1941). This hypothesis is not precise enough to permit a deduction which would make possible an exact experimental test, *i.e.*, a deduction defining the conditions which would produce a measurable change in the rotation phenomenon. It was therefore necessary to arrive at more definite ideas about figure-ground relations. Such ideas were found in three hypotheses developed by Goldstein and Scheerer (1941) to account for variations in speed of carrying out the Block Design test. The first of these is that the square orientation (e.g., Cards a and b in Illustration 2) of a figure would tend to diminish the frequency of appearance of the anomaly, while the diamond orientation would increase it (e.g., Cards c and d in Illustration 2).

The second hypothesis is concerned with the influence of the factor of congruence between figure and ground. Where figure and ground are of the same shape and similarly oriented they are said to be congruent (Illustration 2, Cards a and c). The hypothesis states that the congruent figure-ground arrangements of the material would tend to decrease the frequency of the appearance of an anomaly, while an incongruent arrangement would increase the frequency. Cards " b " and " d " in Illustration 2 would be said to be incongruent.

The third hypothesis is concerned with the relative influence of congruence and orientation of figure (and is only implicit in Goldstein and Scheerer's statements). Where the influence of congruence and figure orientation are in conflict the influence of the figure orientation is more potent.

These three hypotheses make it possible to build up a definite order of frequency of appearance of the anomaly. The patient ought to produce the anomaly least frequently for figure-ground combination " a " (Illustration 2), more frequently for combination " b," still more frequently for " c," and most frequently for combination " d."

These three hypotheses were then tested in experiments carried out on a single patient who had shown the rotation effect in the course of routine testing. These experiments consisted of presenting the patient with designs drawn on cards in such a way as to fulfil the conditions required by the Goldstein-Scheerer hypotheses.

The type of cards is exemplified by Cards " a," " b," " c " and " d " in Illustration 2. In all there were 144 trials with 36 trials for each card.

The first hypothesis, concerning the effects of figure-shape, was directly negatived by the findings. The square shaped figure produced the anomaly 51 times out of a possible 72, while the diamond oriented figure produced the anomaly 9 times out of a possible 72. The difference was significant at the 1 per cent. level.

The second hypothesis, that concerning the influence of congruence, was not substantiated, though the results were in the right direction. Congruent cards produced rotations 27 times out of a possible 72, while incongruent cards produced the anomaly 35 times. These differences were not significant at the 5 per cent. level.

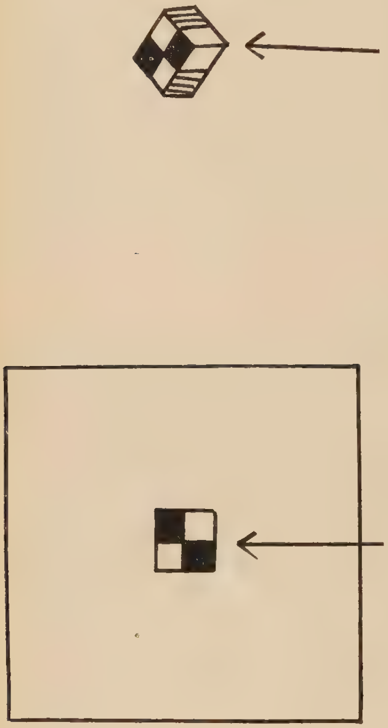


Illustration 1.

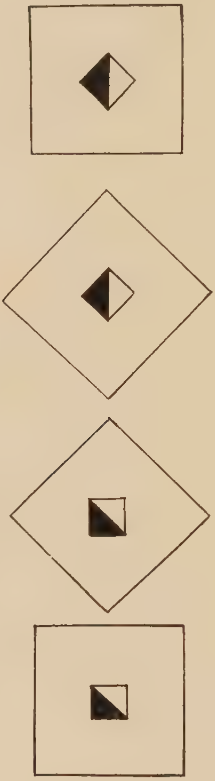


Illustration 2.

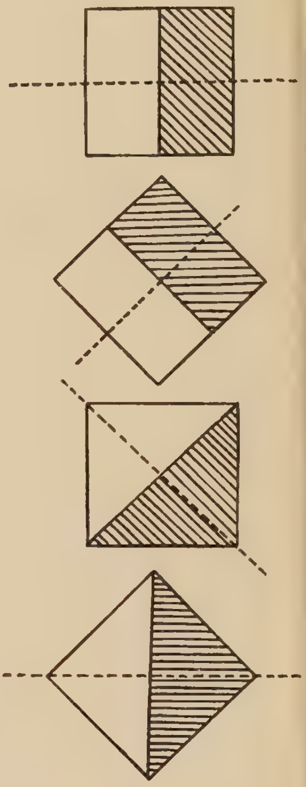


Illustration 3.

The data were re-examined and three new hypotheses emerged. The first of these arose from the observation that in the first experiment the designs accidentally possessed one common quality. They all possessed diagonal lines of symmetry. This means that each of the designs could be divided into two perfectly mirrored halves by a diagonal line (see Figs. 3 and 4 in Illustration 3). It was also noticed that when the line of symmetry of a design was parallel to the vertical axis of the visual field the frequency of the appearance of the anomaly was minimized ; and when the line of symmetry was at an angle to the vertical axis of the visual field, the frequency of the appearance of the anomaly was maximized. This finding was significant at the 1 per cent. level. A second feature of the data was that when the shape of the ground was diamond, the frequency of the appearance of the anomaly was increased ; and when the shape of the ground was square, the frequency of the appearance of the anomaly was decreased. This finding was significant at the 5 per cent. level. Finally it was observed that the found order of frequencies of appearance could be accounted for by the assumption that where the effects of the line of symmetry and the shape of ground were in conflict, the effects of symmetry would be more potent. These findings fully account for the observed order of increasing frequency of appearance of the anomaly. This was, according to Illustration 2: " d," " c," " a," " b."

It was decided to test the first of the new hypotheses by presenting the subject with designs of different structure, i.e., of rectangular symmetry (see Figs. 1 and 2 in Illustration 3). This meant that where before the diamond oriented figures had produced few anomalies, they now would produce more; and where before the square oriented figures had produced more anomalies they would now produce less. The experiment also made it possible to confirm the other three hypotheses under new conditions. Two experiments were carried out and the findings were at the 1 per cent. level of significance for the line of symmetry and at the 5 per cent. level for ground shape. The predicted order was obtained in both experiments.

B. Methodological Implications.

There are two general conceptions underlying the first experiments. First of all, any apparent dysfunction in a given patient, when brought under precise experimental control in relation to formulated hypotheses, may, on further investigation, be found to be related to more general and important aspects of that patient's disorder. By " experimental control " it is meant that the conditions of the appearance, development and non-appearance of the phenomenon can be defined and demonstrated. The second assumption is that the establishment of experimental control of an aspect of function in a single case must be related to laws of general applicability, i.e., it must be applicable to many other cases.

Acceptance of these two assumptions would make it possible for the psychologist to embark with confidence on an experimental investigation of a single aspect of function in a single case. Unfortunately many psychologists appear to work on the unproven assumption that in most cases the precise experimental control of a single aspect of function of a single case *must* result in unique findings, findings which will be incapable of generalization, either to other aspects of the individual's function or to the same function in other people. This assumption has done much to paralyse effective experimental work in clinical psychology and is, in the writer's opinion, one of the main factors preventing it from becoming a science.

This does not mean that there is no need to know to what extent any finding can be generalized. However, this will inevitably be revealed if the psychologist follows up the problems presented by his data in a rigorous manner. By rigour is meant, first of all, that no experiment is ever conducted unless a formulated explanatory hypothesis is being tested. Secondly, no hypothesis is ever considered unless testable deductions can be made from it. Such deductions must result in experiments in which the phenomenon concerned varies its appearance in a manner which confirms or contradicts the hypothesis. Such an approach would, of course, become an empty drill, if the hypotheses which are developed are not explanatory and capable of wider application beyond the immediate limits of the point of the investigation.

With these considerations in mind, a preliminary investigation was carried out with 9 patients. The outcome of this was sufficiently clear to formulate an hypothesis about the kind of patients in whom the anomaly may be found. This was that the block design rotation effect was associated with brain damage. This had already been suggested by Goldstein and Scheerer (1941) who believe the effect to be linked with sub-cortical lesions.

C. The Experiment.

There were two aims in this experiment. The first may be called confirmatory, i.e., to establish the extent to which the laws established for the first patient are correct for others who show the rotation effect. The second aim may be called explanatory, i.e., to test the hypothesis that the rotation effect is due to brain damage.

(1) *Procedure.*—It was decided to carry out the confirmatory aspect of the project by operating a standard experiment with the Block Design material on a series of patients. This standard experiment was, in fact, a test which was specially designed to meet both theoretical and practical needs. It will henceforth be referred

to in this article as the Block Design Rotation Test. A description of this test is given in the Appendix.

In order to test the explanatory hypothesis that the rotation effect was associated with brain damage, two groups of patients were selected, each group containing 19 subjects. One group consisted of patients each of whom, in the opinion

TABLE I.—*Diagnostic Classification.*

(a) *Brain-Damaged Patients.*

(These classifications were made by Dr. D. Leigh, Physician, Maudsley Hospital.)

No.	Age.	Sex.	Diagnosis.
1	23	F.	Idiopathic epilepsy.
2	28	F.	Prefrontal leucotomy.
3	39	F.	Cyst right occipital lobe.
4*	40	M.	"Punch drunk"—basal ganglia lesion.
5*	40	M.	Parkinsonian.
6	44	F.	Carbromal addiction.
7	41	F.	Glioma right cerebral hemisphere.
8	37	F.	Tabes—neuro-syphilis.
9*	32	M.	Parkinsonian.
10	38	M.	Old meningo-encephalitis.
11	42	F.	Leucotomy.
12*	39	M.	Huntington's chorea.
13*	41	M.	Huntington's chorea.
14	22	F.	Disseminated sclerosis.
15	43	M.	Prefrontal leucotomy.
16*	43	M.	Parkinsonian.
17	38	M.	Post-traumatic epilepsy.
18*	17	M.	Severe head injury with damage to basal ganglia principally.
19	45	F.	Compensation neurosis. No organic disorder.

* Cases clearly involving basal ganglia lesions.

(b) *Non-Brain-Damaged Patients.*

(These classifications were taken from the Case Notes.)

No.	Age.	Sex.	Principal disease.	Principal complication.	Principal accessory. Acute.	Principal accessory. Chronic.
1	21	F.	Reactive neurotic depression	..	..	..
2	26	F.	Anxiety state	Pregnancy	..	..
3	40	F.	Schizoid personality	..	..	..
4	40	M.	Hysterical reaction	..	..	..
5	43	M.	Carcinoma bronchus	Delusional state and fugue	..	..
6	44	F.	Obsessional state	Depression	..	..
7	41	F.	Gilles de la Tourette disease	Obsessive compulsive reaction	Hysterics	..
8	39	F.	Depression	..	..	Migraine
9	34	M.	Schizo-affective psychosis	..	..	..
10	39	M.	Paranoid schizophrenia	..	..	..
11	43	F.	Anxiety hysteria	..	..	..
12	37	M.	Neurotic reactive depression	..	..	..
13	42	M.	Reactive depression	..	..	..
14	22	F.	Anxiety reaction	Depression and palpitations	..	..
15	42	M.	Pernicious anaemia	Reactive depression subacute combined	..	..
16	44	M.	Neurotic depressive reaction	Obsessive-compulsive reaction	..	..
17	36	M.	Paranoid schizophrenia	..	..	..
18	17	M.	Immature personality	Delinquency	..	..
19	43	F.	Hysteria	..	..	Cervical root lesion

of the doctor in charge of the case, had a history and/or symptomatology uncontroversially consistent with the possibility of brain damage. The other group consisted of patients who, in the opinion of the doctor in charge, had a history and/or symptomatology which was uncontroversially inconsistent with the possibility of brain damage. Patients who were likely to receive E.C.T. were excluded from this group because they were required for another psychological investigation that was going on at that time. Patients were accepted for the two groups on the basis of the doctor's opinion at the time of testing. If the doctor's opinion changed after this, the patient was still kept in the category to which he was first assigned. The patient's final diagnosis and code number are given in Table I.

In order to minimize the effects of mental defect and age, no patient was included whose Wechsler vocabulary score was under 6 weighted points, and all patients were between the ages of 18 and 45 inclusive. Each member of the brain damaged group was matched by a non-brain damaged patient who was of the same sex, and not more than two years older or younger. Each patient received the following tests before taking part in the experiment: Wechsler Block Design, Similarities and Vocabulary sub-tests, and the U.S.E.S. Manual and Finger Dexterity tests.

(2) *Results:* (a) *Confirmatory.*—An examination of Table II shows that the symmetry hypothesis is confirmed; 19 out of 19 brain damaged patients produced more rotation for the angled line of symmetry than for the vertical line of symmetry, while 18 out of the 19 controls behaved in a similar way. No tests of significance are necessary here. The one reversal is small, providing a total difference of 9° and occurred in a patient who rotated very little.

In the case of ground, the diamond-shaped ground produced more rotation than square ground as was predicted. The difference was significant at the ·01 level in the case of the brain-damaged patients, but not significant in the case of the non-brain-damaged patients. The results are given in Table III.

The hypothesis on the relative strength of symmetry and ground is clearly confirmed. This is shown by the fact that C type cards (as shown in Illustration 4) produced significantly more rotation than B type cards (t is significant at the ·0005 level for the brain-damaged group, and at the ·005 level for the non-brain-damaged group) in Table IV.

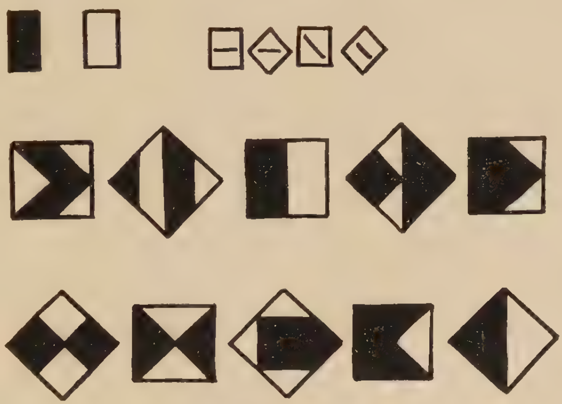


Illustration 4.

Of the Goldstein-Scheerer hypotheses, only one was confirmed by the data. This was that the figure in the square orientation would produce less rotation than a figure in diamond orientation. 37 out of the 38 patients acted in accordance with this hypothesis (Table V).

This result means that both characteristics of a figure, its shape and its line of symmetry, affect the amount of rotation. Their relative effects are not, however, clearly established, as is shown by the data for figures of diagonal symmetry. These are figures in which the direction of the effect of the line of symmetry is opposite to that of figure shape, as is shown by Figs. 3 and 4 in Illustration 3. An examination of Table VI shows that, in these figures of diagonal symmetry the influence

TABLE II.—*Showing the Amount of Rotation Produced by each Patient for Angled and Vertical Lines of Symmetry.*

(a) *Brain-Damaged Patients.*

	Patient No.																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Angled line of symmetry .	302	78	178	304	218	418	86	279	321	134	89	115	530	109	103	226	54	293	71
Vertical line of symmetry .	109	60	13	18	143	65	18	168	11	35	12	50	48	8	10	5	12	225	11

(b) *Non-Brain-Damaged Patients.*

	Patient No.																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Angled line of symmetry .	72	104	82	90	96	59	56	231	57	151	59	51	68	37*	65	92	53	46	85
Vertical line of symmetry .	14	22	29	4	7	10	11	98	13	31	15	7	28	46	52	90	6	30	32

* Inconsistent with hypothesis.

TABLE III.—*Showing the Amount of Rotation Produced by each Patient for Square and Diamond Ground.*

(a) *Brain-Damaged Patients.*

	Patient No.																			Mean.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
Square ground .	148	59	119	193	128	171	42	154	126	70	70	66	200	49	35	102	37	239	46	108·11
Diamond ground .	263	79	72	129	233	312	62	293	206	99	31	99	378	68	78	129	29	279	36	151·32

t = 2·802. Significant at ·01 (1-tail test).

(b) *Non-Brain-Damaged Patients.*

	Patient No.																			Mean.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
Square ground .	41	59	50	32	19	40	22	64	27	56	37	19	49	27	65	89	33	33	50	42·74
Diamond ground .	45	67	61	62	84	29	45	265	43	126	37	39	47	56	52	93	26	43	67	67·74

(a) *Brain-Damaged Patients.*

	Patient No.																			Mean.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
C type card .	118	30	111	189	70	164	39	88	120	55	66	50	179	45	31	97	29	110	35	85·58
B type card .	79	31	5	14	85	58	15	102	5	20	8	34	27	4	6	0	4	96	0	31·21

t = 4·315. Significant at ·0005 level (1-tail test).

(b) *Non-Brain-Damaged Patients.*

	Patient No.																			Mean.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
C type card .	32	48	44	31	19	35	20	51	25	41	30	16	39	21	34	59	29	24	39	33·53
B type card .	5	11	23	3	7	5	9	85	11	16	8	4	18	40	21	60	2	21	21	19·47

t = 3·542. Significant at ·005 level (1-tail test).

B type card was characterized by figures with vertical lines of symmetry in a diamond ground, whereas card type C was characterized by angled lines of symmetry in a square-shaped ground.

TABLE V.—*The Amount of Rotation Produced by each Patient for Square and Diamond Figures.*

(a) *Brain-Damaged Patients.*

	Patient No.																			Mean.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
Square figure .	93	35	67	123	97	143	37	108	32	83	14	65	337	34	34	14	26	157	32	80·58
Diamond figure .	318	103	124	199	264	340	67	339	300	86	87	100	241	83	79	217	40	361	50	178·84

t = 4·319. Significant at ·0005 level (1-tail test).

(b) *Non-Brain-Damaged Patients.*

	Patient No.																			Mean.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
Square figure .	39	43	36	37	38	19	28	40	24	68	16	19	12	51	24	68	8	16	26	32·21
Diamond figure .	47	83	75	57	65	50	39	289	46	114	58	39	84	32	93	114	51	60	91	78·26

t = 3·48. Significant at ·005 level (1-tail test).

TABLE VI.—*The Amount of Rotation Produced by each Patient for Angled Lines of Symmetry and Vertical Lines of Symmetry with Designs of Diagonal Symmetry.*

(a) *Brain-Damaged Patients.*

	Patient No.																			Mean.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
Angled line of symmetry .	67	34	60	119	39	108	37	94	21	70	13	54	325	32	31	9	26	83	32	66·00
Vertical line of symmetry .	83	59	6	14	85	30	18	154	0	22	11	39	36	6	7	0	12	151	11	39·16

t = 1·52. Not significant.

(b) *Non-Brain-Damaged Patients.*

	Patient No.																			Mean.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
Angled line of symmetry .	38	39	33	37	38	18	27	24	23	65	16	19	7	14	18	18	8	12	25	25·21
Vertical line of symmetry .	13	18	26	4	7	9	10	82	12	28	15	7	23	9	46	40	6	26	31	21·68

t = <1·0. Not significant.

(a) *Brain-Damaged Patients.*

Patient No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Mean.
Angled line of symmetry .	235	44	118	185	179	310	49	185	300	64	76	61	205	77	72	217	28	210	39	139·68
Vertical line of symmetry .	26	1	7	4	58	35	0	14	11	13	1	11	12	2	3	5	0	74	0	14·58

t = 6·60. Significant at ·0005 level (1-tail test).

(b) *Non-Brain-Damaged Patients.*

Patient No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Mean.
Angled line of symmetry .	34	65	49	53	58	41	29	207	34	86	43	32	61	23	47	74	45	34	60	56·58
Vertical line of symmetry .	1	4	3	0	0	1	1	16	1	3	0	0	5	37	6	50	0	4	1	7·0

t = 5·47. Significant at ·0005 level (1-tail test).

TABLE VIII.—*The Amount of Rotation Produced by each Patient for Congruent and Incongruent Cards.*

(a) *Brain-Damaged Patients.*

Patient No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Mean.
Congruent .	214	60	75	206	242	207	69	261	200	104	33	90	217	58	64	135	35	266	40	135·26
Incongruent	197	78	116	116	119	276	35	186	132	65	68	75	361	59	49	96	31	252	42	124·16

t = <1·0. Not significant.

(b) *Non-Brain-Damaged Patients.*

Patient No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Mean.
Congruent .	26	62	45	39	64	26	37	255	31	86	35	36	45	19	46	47	26	47	49	53·75
Incongruent	60	64	66	55	39	43	30	74	39	96	39	22	51	64	71	135	33	29	68	56·74

t = 0·31. Not significant.

of line of symmetry is apparently greater than that of figure shape because the total amount of rotation produced is greater for the angled line of symmetry than it is for the vertical line. The difference is not, however, significant.

When the effect of symmetry and figure shape are in the same direction, as in figures of rectangular symmetry, there is an increase in the rotation produced (see Figs. 1 and 2 in Illustration 3) by the angled line of symmetry, as compared with the vertical line of symmetry. The differences between the vertical and angled lines of symmetry are now significant at the ·0005 level for both brain-damaged and non-brain-damaged groups. The data are given in Table VII.

In the light of these findings, it is necessary to formulate two further generalizations, additional to those formulated in Section A of this article, on the factors affecting the block design rotation effect. These are: (*a*) that the square-oriented will tend to produce less rotation than the diamond-oriented figure; (*b*) that where the effect of line of symmetry and figure shape are in conflict, the relative amount of rotation produced by angled symmetry will be lessened to the point of not being statistically significant. The gross results are, however, in the predicted direction.

The other Goldstein-Scheerer hypotheses (in Section A) were found not to be confirmed by the data. Table VIII shows that there is not a significant difference between amount of rotation produced by congruent cards as compared with incongruent cards.

Exceptions.—So far only two apparent exceptions to these findings have appeared in other work undertaken by the writer with the rotation effect. The results are shown in Table IX.

TABLE IX.

Number of rotations

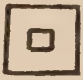
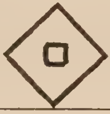
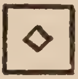
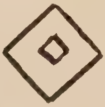
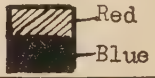
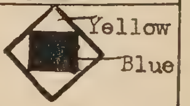
Card					Design Used
Patient 1	0	6	0	0	
Patient 2	0	3	4	0	

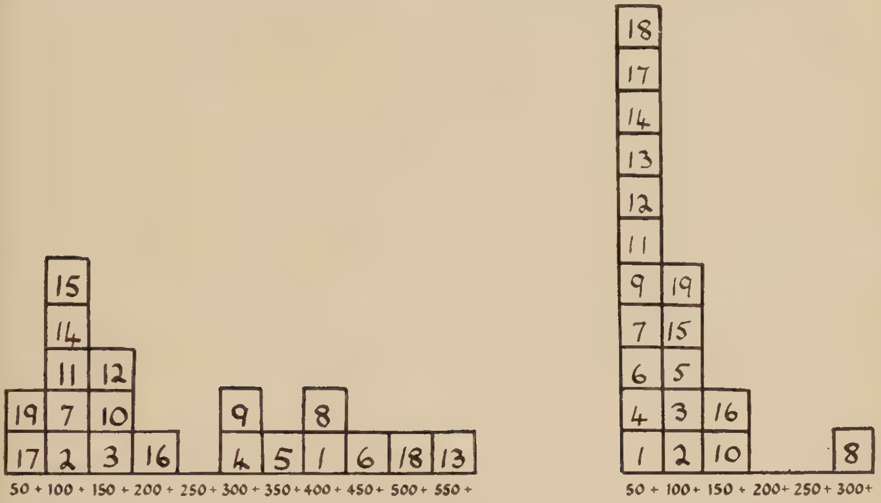
TABLE X.—*Reliability Experiments.*

Experiment No.	Number of trials.	Mean error (ignoring signs).	Standard deviation of error.	Range.
1	17	3·2°	3·2°	0° to 4°
2	17	4·1°	4·0°	0° to 14°
3	17	2·9°	2·2°	0° to 7°
4	40	0·9°	1·3°	0° to 4°
5	40	1·1°	1·2°	0° to 5°
6	17	3·2°	6·1°	0° to 27°
6*	16	1·8°	1·4°	

* Repeat of Experiment 6 with the exclusion of 1 error of 27°.

In both cases there appears to be at work some definite tendencies which do not accord strictly with the findings outlined above. Before considering any possible explanations of these findings it is necessary to try to find these patients as they have been discharged and retest them on the Block Design Rotation test used in this investigation.

(b) *Explanatory.*—The results show that the rotation tests differentiate at the ·0005 level between the brain damaged and non-brain-damaged group (see Histogram). An incidental result of some interest is the fact that of the seven patients in the brain-damaged group who could be unequivocally classified as having lesions of the basal ganglia, six have a rotation score greater than 200°. Only one of the control group has such a score and the sixth one has a borderline score (these patients are indicated in Table I). This result is consistent with the Goldstein-Scheerer statement that the rotation effect is associated with subcortical lesions. However a "t" test showed that the total amount of rotation produced by this sub-group was not significantly different from the amount produced by the remainder of the brain-damaged group.



Histogram.

D. Discussion.

The explanatory results reported above should be related to a recent publication by Hanvik and Anderson (1950). They gave the Bender Visual Motor Gestalt test to 44 patients with focal lesions and 37 non-brain-damaged patients. After a lapse of time, the length of which is not stated, they asked these patients to reproduce the drawings; these were rotated very frequently by the brain-damaged cases. These findings are therefore consistent with the notion that brain damage is associated with a rotation effect in visual perception. A point of interest is that Hanvik and Anderson's cases presumably have cortical lesions, a fact which will have to be linked in the further investigation of the association of basal ganglia lesions with the Block Design rotation effect. The work of Bender and Teuber (1948) also provides some related evidence. They say of a patient with damage to the occipital and posterior part of the parietal lobes that "forms were correctly recognized and correctly reproduced . . . but appeared to be rotated in the two dimensional (coronal) plane."

A further point of interest arises from the finding that figure shape has an effect on the amount of rotation. In the light of this, it is necessary to reconsider the opinions expressed in the first article (Shapiro, 1951), on the notion of "good form." While we still have the difficulty that this notion is left expressly undefined, the fact is that both the diamond figure, which Goldstein and Scheerer regard as having worse form than the square, and the angled line of symmetry which might be presumed to have worse form than the vertical, produce the rotation effect. Thus the results could be said to be consistent with the idea of good form. The difficulty still remains for the writer that there is nothing in Koffka's definition of "prägnanz" which would have enabled him to deduce these effects.

It will now be necessary to carry out further the work on more specific localization hypotheses; the main one suggested by this study being that the rotation effect is associated with basal ganglia lesions. The usefulness of such research, however, can only be guaranteed by the development and testing of hypotheses which, in accounting for the facts, will reveal something of the psychophysiological causes of the rotation effect. It is along these two main lines that present research is proceeding.

E. SUMMARY.

The Block Design Rotation test was given to 19 patients diagnosed as brain damaged, and 19 patients diagnosed as non-brain damaged. The following findings emerged :

(1) Brain damaged patients produce significantly more rotation than non-brain damaged patients.

(2) When the line of symmetry of a design is at an angle to the vertical axis of the patient's visual field, significantly more rotation is produced than when it is parallel to that axis.

(3) The diamond-oriented *figure* produces significantly more rotation than the square-oriented *figure*.

(4) The diamond-oriented *ground* produces significantly more rotation than a square-oriented *ground*.

(5) When the influence of line of symmetry and *ground* shape are in conflict, the line of symmetry is more powerful.

(6) When the influence of the line of symmetry and of *figure* shape are in conflict, the line of symmetry is more powerful, but not significantly so.

(7) There is no demonstrable effect of congruence of figure and ground, i.e., of a gestalt relationship which is independent of the parts.

ACKNOWLEDGMENTS.

To the medical and nursing staff of the Maudsley and Bethlem Hospitals for helping in the selection of subjects ; to Miss Daphne Webb for preparing and typing the manuscript ; to Mrs. N. Standen who carried out the statistical treatment of the data ; and to Dr. H. J. Eysenck for discussion of methodological problems and encouragement.

Part of the work reported in this paper was made possible by a grant from the Research Fund made available from the endowment by the Board of Governors of the Bethlem Royal Hospital and the Maudsley Hospital.

F. APPENDIX.

Block Design Rotation Test.

(1) The test is made up of 10 different designs which are shown in Illustration 5. No principle was observed in choosing them except that half of them were of rectangular symmetry and half of diagonal symmetry. All of them were blue and yellow in colour and it was hoped that no designs would be so difficult that more than 25 per cent. of the patients would be unable to complete them.

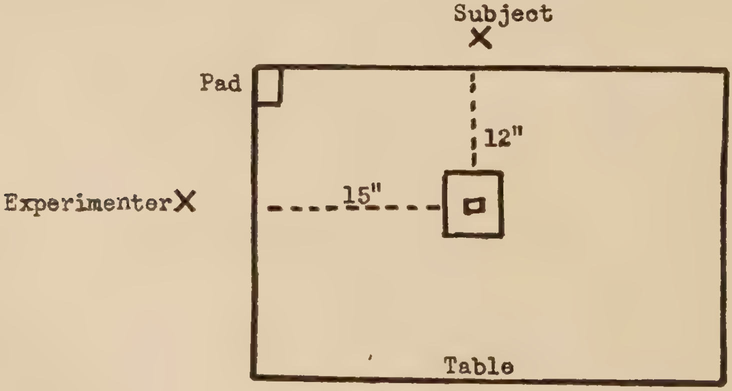


Illustration 5.

(2) *Cards.*—Each design had to be presented in the four situations which are deduced from the hypotheses in Section A above. Each design, therefore, was presented four times in combinations A, B, C, D, as shown in Illustration 4.

(3) *Order of presentation.*—The order of presentation presented a problem because the effects of learning, fatigue and perseveration were unpredictable. Miss Joan May therefore designed an order which aimed at balancing these effects.

The detailed instructions for the test consist essentially of the fact that the patient had to work in a definite part of the table and that the card was always placed on a single position which was marked on the table. This position was that the centre of the card was always 15 inches from the side of the table and 12 inches from the bottom. The experimenter sat in the position shown in Illustration 5. Tacked down in front of him was a pad of blank sheets.

(4) *Instructions to the patient.*—Procedure: The patient sat at a table in the position marked Subject in Illustration 5. The experimenter (the writer in this case) sat in position marked Experimenter in Illustration 5. The standard verbal instructions were given to the patient to the effect that he had to reproduce the designs on the card with the four blocks and that he had to do all his work near the edge of the table immediately opposite him. He was told and shown that all the blocks were identical in shape and colour, and shown what colours they were. As soon as the card was placed in position a stop watch was started. The time limit was three minutes. When the patient seemed to have completed his model, he was asked "Is that correct?" If the patient said "Yes" or indicated doubt the trial was regarded as completed. The watch was stopped and the time recorded. The actual angle of completed design was recorded on a pad in front of the E. This pad was of octavo size and was pinned down in front of the E., always in the same position for every patient. E. lined his ruler on the pad until he judged it to be parallel to the line of symmetry in the design the S. had completed. In designs Nos. 6 and 7 (see Illustration 4) where there are two lines of symmetry in each design, the line which cut the blue portions was taken arbitrarily as the line of symmetry.

(5) *Error of measurement.*—Experiments were carried out on the experimenter to obtain some idea of his error of measurement. These consisted essentially of having the blocks placed in various known rotations and comparing the angle of his drawn line of symmetry with the angle of actual line of symmetry of the actual blocks. In a series of six such experiments, over a period of four months, the experimenter's average error varied from 4·1° to 0·9° with a range of 0° to 14° (except for one outstanding trial). The necessary details are given in Table X, the greatest error recorded was one of 27°. This might have been due to the fact that the experimenter in this trial had misplaced the blocks. This is indicated by the fact that the next greatest error for any of the six experiments is 14° and also by the fact that an error of 27° is at least 5·5 standard deviations from the largest mean.

These results cannot be taken as a reliable indication of the experimenter's error in the actual experiment. All they indicate is the extent of error under conditions in which the experimenter knew he was being tested for reliability. However, the smallness of the error indicates an acceptable degree for reliability for the method of measuring the results in the preliminary investigation reported here.

REFERENCES.

BENDER, M. B., and TEUBER, H. L., "Spatial Organization of Visual Perception following Injury to the Brain," *Arch. neurol. Psychiat.*, 1948, **59**, 39–62.

GOLDSTEIN, K., and SCHEERER, M., "Abstract and Concrete Behaviour," *Psychol. monogr.*, 1941, **53**, 2.

HANVIK, L. J., and ANDERSEN, A. L., "The Effect of Focal Brain Lesions on Recall and on the Production of Rotations in the Bender Gestalt Test," *J. consult. Psychol.*, 1950, **14**, 197–198.

SHAPIRO, M. B., "Experimental Studies of a Perceptual Anomaly. I. Initial Experiments," *J. ment. Sci.*, 1951, **97**, 90–110.

CLINICAL AND E.E.G. ASPECTS OF PSYCHIATRIC DISORDERS ASSOCIATED WITH TETANY.

By D. S. G. M. Bailey, M.B., B.S.,
J. F. Donovan, M.R.C.S., L.R.C.P., D.P.M.,
and
A. J. Galbraith, M.D., D.P.M.
St. Francis Hospital, Haywards Heath, Sussex.

While the main syndrome of tetany arising from hypoparathyroidism is widely recognized, it is doubtful if a sufficiently comprehensive view has been taken of the extensive range of manifestations which may be presented. The underlying pathological mechanisms may also be complex, and the circumstances under which hypoparathyroidism may develop are not always self-evident. Lyle (1949) attempts to classify hypoparathyroidism on an aetiological basis, and distinguishes post-operative, intrinsic, extrinsic, and idiopathic types. In our paper we are mainly concerned with tetany following thyroidectomy, the incidence of which has been estimated by Bell and Bartels (1951) as 2·9 per cent., based on their observations of 2,000 consecutive operations. The case which we are going to describe is one in which a history of thyroidectomy did not immediately appear significant in relation to the presenting features. Admission to hospital followed the onset of a psychotic illness, which in itself did not indicate any underlying organic disturbance, despite an account of an occasional epileptic attack some time previously. The latter feature, however, led to routine E.E.G. investigations. These are of particular interest in this case, especially as some of the recordings had been made before the diagnosis of hypoparathyroidism was established, and before the significance of the fits in the clinical syndrome was appreciated.

Case Record.

Miss D. C—. The patient is a single woman aged 43, who was a trained children's nurse. There is nothing noteworthy in her early history. Her elder sister described her as a " clinging type who made friends to whom she was generous, but was otherwise parsimonious." In her family circle she had been devoted to a younger sister who died at the age of 26 from phthisis, but seemed rather resentful of the elder sister, who was critical and dominating. Her childhood was unsettled to some extent because of her mother's invalidism (disseminated sclerosis), which resulted in an upbringing by relays of paid companions. Her father was an aloof man, of whom as a child she lived in awe. She had a high school education, but had not taken her school certificate when she left at the age of 16. She then trained as a children's nurse, and after working in a number of private households and residential nurseries, she rose to a position of some responsibility in charge of a home for " unbilletable " child evacuees during the Second World War. It can be said that up to this time her health and prospects had been reasonably satisfactory.

Her job ended with the cessation of hostilities, and before she took up any new work her elder sister persuaded her to seek medical advice for a swelling in the neck. After examination by a physician she was referred to a London hospital, where in May, 1946, she had a thyroidectomy. The report on her case at that time is as follows : " This patient was admitted with a history of a swelling in the neck of one year's duration. There were no symptoms suggestive of thyrotoxicosis, and a partial thyroidectomy was carried out, neither inferior artery being tied. She had a post-operative immobility of the right vocal cord which had apparently recovered at the time of her discharge. The histological report was of colloid goitre."

When she left hospital she went to stay with friends and began to feel undue lassitude which restricted her activities. She describes how she became exhausted on the slightest exertion and complained of " muscular weakness " and occasional attacks of " pins and needles " in her legs. After three months she was put on extra milk, and tablets (? calcium) were prescribed. She improved to some extent but by no means regained her normal state of health.

In December, 1946, she decided to try and start work again and obtained a position as house warden of the students' home of a residential nursery. In February, 1947, she was ill for several weeks with an alleged attack of influenza, of which she has only a vague recollection, and during which she appears to have been in a somewhat confused state of mind. While she was able to resume work after this illness and continued until 1948, she was never fully satisfied with her condition or her capabilities. Her present view is that her "mentality had started to go downhill from the time of the thyroid operation," and she "could not get at things properly." Her duties were such that she was able to take a rest after lunch, and was glad to do so. She now emphasizes that this habit was very contrary to her normal mode of life. In addition to her lack of physical and mental vigour she felt handicapped by contact with a friend and colleague who had outstanding ability and energy and by whom the patient felt dominated. By January, 1948, she was so unhappy that she was contemplating her resignation, and events were brought to a head when she had a major epileptiform convulsion while at the breakfast table. In describing this incident she recalled that she had got up earlier than usual, and had been busy and active for some time before going to breakfast. After regular phenobarbitone (gr. $\frac{1}{2}$ *t.i.d.*) had been prescribed by the doctor who was called in to see her, she realized the probable significance of the episode and tendered her resignation. It was not until May of the same year that this was implemented, and she had had no further fits in the meantime. One other symptom which was first noticed while the patient held her warden's appointment was that she frequently suffered from a momentary loss of voice, especially after physical exertion.

After giving up her work she lived quietly with a friend in the country, and on the whole felt better except that she still noticed that she was easily fatigued. In December, 1948, she contemplated resuming work and went to London for an interview. On the day of the interview she tried to combine business with shopping and sight-seeing, and did what she called "a lot of rushing around." On the return journey that evening she had a fit in the train.

A month later she had dental extractions under a general anaesthetic but did not feel any particular ill-effects. A few days subsequently, however, she noticed a temporary inability to grip properly with either hand, but does not recollect any feeling of stiffness or tingling.

In February, 1949, she was readmitted to the hospital where her thyroid operation had been carried out, for investigation of her epilepsy (i.e., the two fits occurring in January, 1948, and December, 1948). No abnormal physical signs were found, B.M.R. was -1 per cent. and the cerebrospinal fluid was within normal limits. An E.E.G. was recorded (which will be discussed later), and the patient was informed that she was suffering from idiopathic epilepsy. At this time she was still taking regular phenobarbitone, but did not tolerate Epanutin, which was recommended in addition. At the time of this investigation she was living with an old family friend, and in view of the confirmed diagnosis of epilepsy abandoned the idea of working again.

In May, 1949, she attended a psychiatric out-patient clinic because of feelings of exhaustion and intermittent weakness of her arms, both symptoms evidently being regarded as functional in character.

Also about this time she began to complain of failing vision. When this was investigated in May, 1949, her acuity was $\frac{6}{6}$, $\frac{6}{9}$, although a very early degree of lens opacity was noted. Her eyesight subsequently deteriorated rapidly, and by January, 1950, she was virtually blind ($\frac{3}{60}$, $\frac{3}{60}$) because of advanced cataract. It was suggested that the cataracts were endocrine in origin and tests were undertaken to exclude diabetes mellitus. In June 1950, a lens extraction was performed on one side which, with glasses, restored vision in that eye to $\frac{6}{9}$.

In the meantime a third fit had occurred in July, 1949. Again she relates that the fit developed after temporary over-exertion. Her activities had been very restricted because of a chronic state of fatigue and, to quote her own words, she was "leading the existence of an old woman of 80."

While ill health continued to be her major problem, in the latter part of 1950 she was also concerned over her financial affairs. This is understandable for, while she had prospects of security under an inheritance, she was still living on her savings. Being naturally parsimonious she attempted to limit her expenditure, and was misguided enough to economize by cutting down her food.

Early in December, 1950, her first psychotic symptoms began to appear. She became suspicious of her friends and neighbours, and developed persecutory delusions which were so distressing that she eventually fled from her lodgings and took refuge in the Y.W.C.A., where she knew the warden. On the following day she was taken to the observation ward, and subsequently entered St. Francis Hospital as a voluntary patient (22.xii.50).

The physical findings at the time of admission were as follows :—

Asthenic type, height 5 ft. 6 in., weight 8 st. 10 lb. Thyroidectomy scar.

Mature soft cataract left eye.

Alimentary system and respiratory system N.A.D.

Cardiovascular system : N.A.D. (B.P. 120/70.)

Central nervous system : Cranial nerves normal. No motor or sensory impairment. Tendon reflexes brisk and equal. Plantar responses flexor.

Blood count: R.B.C. 3·63 m./c.mm.; Hb. 76 per cent.; C.I. 1·06; W.B.C. 5,800 c. mm.

Blood Wassermann and Kahn: Negative.

Urine: N.A.D.

Fractional test meal: Within normal limits (free HCl present).

Fasting blood sugar: 70 mgm. per cent.

On admission there was no evidence of confusion and she readily related her history. She described how about two weeks previously she began to feel acutely ill and suspected that she had been poisoned: ". . . E— was giving me doped pastry and the governess had given me a hypodermic shot of belladonna. I also thought that the landlady had been taking dope herself and doping me to try and get my money. I suspected the whole district of being involved in this plot to influence me and obtain my money—even the milkman, the baker and the doctor." At this stage she showed slight insight into her condition, and declared that she was willing to regard her symptoms as "imagination" if she was reassured by competent authorities. A week later, however, she was fully convinced that her paranoid ideas were true and not the results of any illness. She demanded her discharge and, as she could not be disuaded, certification became necessary.

Her paranoid state persisted unabated for about three months and her delusional system extended to her present environment. She now believed that she had been given injections during the night by an unknown person. Her psychosis then gradually became less intense, and by the end of April, 1951, she no longer expressed any obvious delusions and appeared to have regained insight into her former condition. She was regraded as a voluntary patient on 8.v.51, and preliminary steps were taken to obtain a vacancy for her in an epileptic colony.

On 11.v.51 she was referred, for a routine check-up, to the Consulting Ophthalmic Surgeon (Mr. C. G. Schurr), who reported: "Patient had right intracapsular lens extraction in June last. The result is very successful and patient sees $\frac{6}{9}$ with a glass. . . . I think she has some oedema of the right disc."

Phenobarbitone (gr. ½ *t.i.d.*) had been administered regularly since admission, but she had a (fourth) major epileptiform convulsion on 7.ii.51. She had another typical major fit on 28.v.51, and for some days afterwards complained of "not feeling well, tingling in the limbs, sensation of being far away and sometimes dizzy." On account of these symptoms she was allowed to rest in bed, and as they did not subside a complete physical examination was made. When asked to breathe deeply she complained that her symptoms all became aggravated and that she felt that she was going to have a "black-out." She was persuaded to continue over-breathing to see if an epileptic fit could be induced, and it was then noticed that she developed bilateral carpal spasm. This suggestive evidence of latent tetany was further investigated and persistent Chvostek's and Trousseau's signs were elicited. The diagnosis was confirmed (7.vi.51) by a serum calcium level of 5·2 mgm. per cent.*

Calcium (pulv. ca. lact. dr. 2 *t.i.d.*) and extra milk were prescribed without resulting in any marked clinical amelioration or alteration of the serum calcium level. Calciferol therapy, instituted on 22.vi.51 resulted in a progressive rise of serum calcium to near-normal levels and produced substantial symptomatic improvement. The patient soon lost all her unpleasant sensations, but even more striking was her greatly enhanced energy and morale. Whereas for the past five years, since her thyroidectomy, she had felt incapable of sustained effort and interest, she now remarked that she was "like my old self again, finding an interest in life, and eager and able to do a day's work."

The serum calcium level was maintained with adequate doses of calciferol and calcium (Fig. 1), and her clinical remission continued uninterruptedly. She remained active and cheerful, her sleep and appetite were good, and menstruation became regular again after a period of six months amenorrhoea. She had no further epileptic attacks.

On 12.x.51 she entered the Sussex Eye Hospital for removal of the cataract in her left eye. This operation was duly performed and she was readmitted to St. Francis Hospital as a voluntary patient on 29.x.51. She reported that, apart from slight twitching in her right arm a few days after the operation, she had had no localized symptoms and had continued to feel well.

On 9.xi.51 she was re-examined by Mr. Schurr (Consultant Ophthalmic Surgeon), who noted that "the right disc is practically normal to-day, although there is still slight blurring of the superior nasal margin. The left disc has ill-defined edges but is not swollen."

She was discharged from hospital on 29.i.52 and took up a new full-time appointment in a children's school.

---

* A serum calcium level of less than 8·5 mgm. per cent. is regarded as being significant in the diagnosis of tetany. Bell and Bartels (1951) in a series of 58 cases found an average initial figure of 7·3 mgm. per cent. Other authors quote a range of between 4·5 and 8·6 mgm. per cent. The serum phosphorous is inversely affected. Lyle considers that any rise above 4·5 mgm. per cent. is abnormal, and a range of between 5·6 and 12·1 mgm. per cent. is recorded elsewhere.

E.E.G. Investigations

The E.E.G. studies in our patient are of special interest in that repeated recordings were made over a considerable period of her illness and at several stages in its progress (Fig. 2). The first record was made at another hospital in February, 1949, as part of the investigation of her epileptic attacks, the second of which

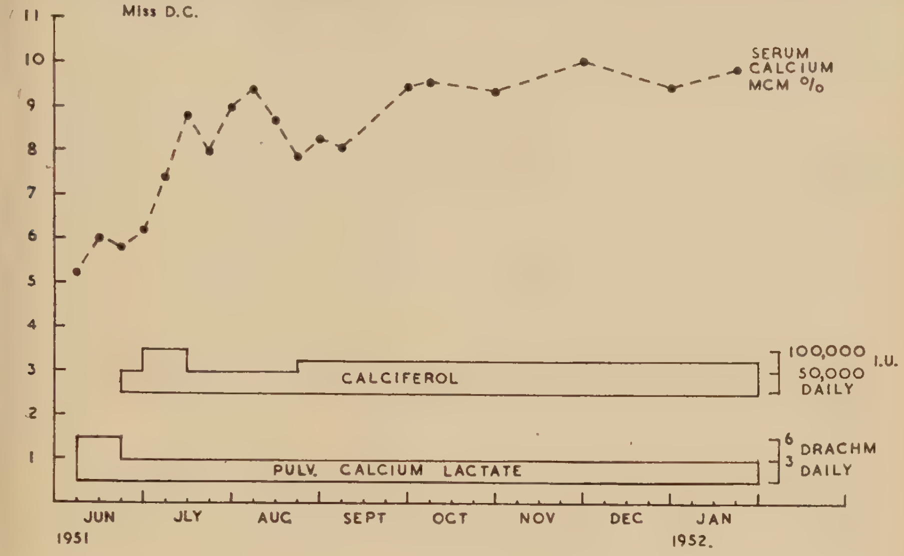


Fig. 1.

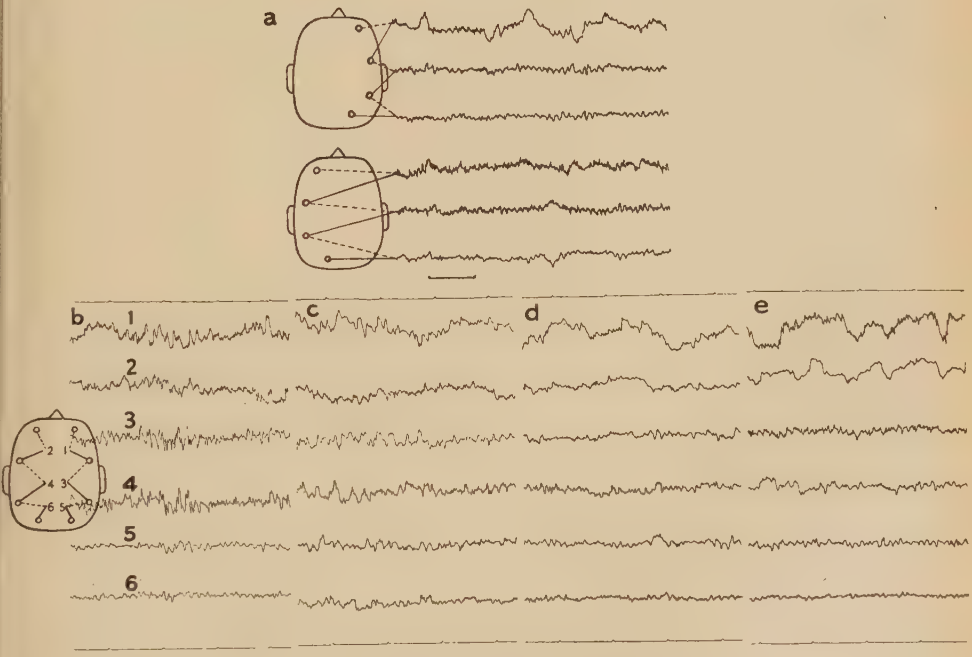


Fig. 2.

(*a*) E.E.G. 21.2.49. Record when epileptic attacks were first investigated.
(*b*) ,, 3.1.51. } Before treatment.
(*c*) ,, 5.6.51. }
(*d*) ,, 20.7.51. } After treatment.
(*e*) ,, 30.8.51. }

had occurred two months previously. This was before the development of a psychosis or any overt manifestation of tetany. The chief features of this record were the presence of 7 c.p.s. activity in addition to the alpha rhythm, and a minimal 4 c.p.s. disturbance in the frontal areas. The record was not altered by hyperventilation.

By the time the next recording was carried out in January, 1951, definite psychotic symptoms were present. A new feature of this E.E.G. was the appearance of fast wave activity at 22 c.p.s. in the central areas. The alpha rhythm had now become sluggish in its response to visual attention and there were definite outbursts of 4 c.p.s. activity in the frontal areas. Marked instability of the record on hyperventilation was noted. Her psychotic symptoms improved and by June, 1951, were no longer in evidence, but the E.E.G. showed further deterioration. The alpha rhythm now appeared definitely "slowed" and 2–2½ c.p.s. slow-wave outbursts were seen. Although no definite focal origin of this activity was apparent, one such burst was seen in the right temporal region alone. At this stage there was a decrease in the amount of fast-wave activity present. The instability of the record on hyperventilation was increased.

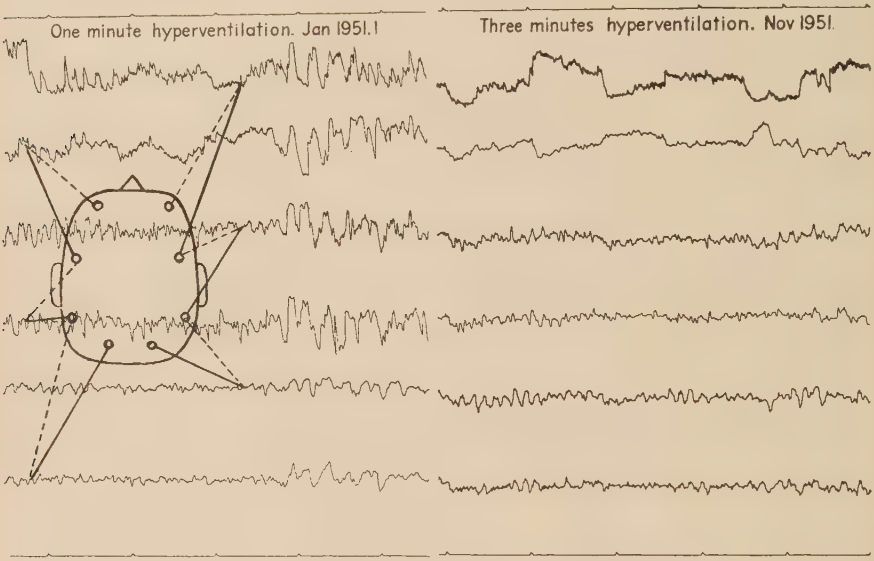


Fig. 3.

It was following this E.E.G. that the diagnosis of hypocalcaemia was made and treatment commenced. The next E.E.G. recording was made in July, 1951, and showed considerable improvement with some restoration of the alpha rhythm. However, the slow wave outbursts at 2–2½ c.p.s. were still seen, and again showed some lateralization in the right hemisphere. This improvement was continued in the records taken in August and November, the alpha rhythm gradually becoming more normal and the slow and fast wave activity in the records diminishing. The instability of the record to hyperventilation appeared considerably lessened in the last E.E.G. (Fig. 3).

Discussion.

The case which we have presented is one in which a diagnosis of post-operative hypoparathyroidism is clearly justifiable, but the presenting features were by no means typical of the syndrome of tetany in its narrowest sense. It is true that during the course of investigation the patient fortuitously exhibited typical manifestations of tetany following hyperventilation, but until then the history of her illness had not suggested the appropriate diagnosis. The development of cataract in a woman of her age had been regarded as of possible endocrine origin, but again there were no classical symptoms of tetany to focus attention on the parathyroids.

The conclusion reached at a still earlier stage, that her epilepsy was idiopathic, was equally misleading. The eventual psychotic breakdown presented no salient features of an organic disturbance, but the subsequent unmasking of a chronic tetany suggested the possibility of a common aetiological basis for the patient's diverse symptomatology.

When the incidence of a psychosis as a complication of tetany was investigated in the literature, it was realized that any discussion on the subject must involve a much wider field than the possible sequelae of thyroidectomy. Lyle (1949), as already quoted, referred to other categories of parathyroid deficiency, and in the earlier references to tetany with psychotic disorder the direct involvement of the parathyroids does not figure prominently.

Barrett (1920), who reviewed the literature commencing with the case described by Tonellé in 1852, drew attention to the relatively high incidence of gastro-intestinal disturbances involved, and remarked that less cases were idiopathic, and only " a few " had occurred after thyroidectomy.

To obtain a comprehensive view of the aetiology of tetany it is necessary to consider those conditions which may give rise to the syndrome apart from primary parathyroid dysfunction. States of alkalosis have long been recognized as progenitors of tetany. Hyperventilation, gastro-intestinal upsets and alkali therapy have all been held responsible. The alteration of pH involved in these conditions results in a relative deficiency of the ionized component of the serum calcium without necessarily lowering the total calcium content of the blood (" eucalcaemic tetany "). It seems possible that the calcium content may be reduced in certain circumstances where the intake, absorption and utilization of calcium is impaired, even when the parathyroids are not primarily concerned. Such conditions as rickets, osteomalacia, sprue and coeliac disease are known to involve inadequate absorption of calcium. In the first two there is an associated vitamin D deficiency, while in sprue and coeliac disease absorption is affected by disordered fat metabolism. Usually about 50 per cent. of the ingested calcium is absorbed, and part of the faecal residue consists of insoluble calcium soaps. This latter fraction increases when fat intake is excessive or when the absorption of fatty acids is incomplete. While actual dietetic insufficiency of calcium cannot be ignored, it seems unlikely that, in the absence of other factors, a low intake alone could result in clinical tetany. Normally the parathyroids would compensate by mobilizing bone calcium, but if their action was impaired the intake of calcium might become significant. The " extrinsic " group in Lyle's classification is therefore not strictly speaking a variety of parathyroid deficiency, although calcium metabolism is affected in a comparable fashion.

The term " idiopathic tetany " now seems to be reserved for those cases of hypoparathyroidism in which disease or damage (operative) is not apparent, although Berezin and Stein (1948) remarked upon the age incidence as falling into two groups which may be aetiologically distinct. These authors point out that most cases of idiopathic tetany arise either in childhood or in middle adult life, and suggest that birth haemorrhage is responsible in the former group and infection in the latter. Developmental errors may, of course, be responsible for some of the earlier type, and this view is supported by Braid (1951), who reports the occurrence of tetany in certain cases of cretinism.

PSYCHOLOGICAL DISTURBANCES ASSOCIATED WITH TETANY.

In Barrett's (1920) review the author concluded that " among the less common toxic mental disorders are those associated with tetany . . . " The types of psychic disturbances which Barrett classified included epilepsy, hysteria and alcoholism, but he confined his comments to " a group . . . in which psychotic disturbances are much more extensive and of longer duration . . . and constitute a fairly well-defined psychosis . . . with characteristic, if not specific, symptomatology." The description of this syndrome would suggest an acute organic reaction with fluctuating periods of stupor, excitement, and lucidity, and characteristic hallucinations and apprehensiveness. The variability of the symptoms was regarded as an outstanding feature which corresponded " with changes in the constitutional and neuro-muscular condition." Barrett himself described two fatal cases in which extensive pathological investigations were carried out. In both instances widespread ganglion-cell degeneration in the central nervous system was found, and likened to changes associated with pellagra and acute and subacute alcoholism. He also commented on similar changes related to experimental extirpation of the parathyroids, although there were no histological findings in the parathyroids in his own cases. The role of the pituitary was also the subject of discussion, as Barrett found small cysts to be present in his cases, and referred to the beneficial effects of pituitary extracts quoted in other clinical and experimental studies. He finally concluded that parathyroid function may be influenced by alterations in the pituitary gland.

The exact significance of the psychosis developing in Barrett's two cases merits further consideration. Despite ultimate similarities in the pathological pictures, the aetiological and clinical features were by no means identical. The first case was manifestly one of severe depression, in which a superimposed organic reaction and tetany developed in combination with gastro-intestinal disturbance. This association of events had figured prominently in the previous literature, generally as a terminal episode. Barrett's conclusion as to their occurrence may not have been strictly accurate, and it is quite conceivable that their intimate relationship was more coincidental than direct. The cerebral changes described by Barrett might have been due to deficiencies of vitamin B complex, which had occurred more or less simultaneously with the manifestations of tetany. Again, the gastro-intestinal disturbances may have been symptomatic of the former condition although responsible for the latter.

Barrett's second case appears to have been one of chronic idiopathic tetany in which a state of stupor eventually occurred. The severity of the tetany was perhaps the outstanding feature of this case, and the prolonged and generalized tonic spasms which characterized the terminal stages must have induced profound somatic exhaustion.

It is of some interest that the ganglion-cell changes described in both Barrett's cases were probably those of "primary irritation," or the later and "severe" cell changes originally described by Nissl. These changes, according to Wertham (1934), cannot be ascribed to a single pathogenic factor, and among the associated conditions are states of exhaustion, pellagra and alcoholism.

Among the more recent references to psychic disorders associated with tetany there is evidence of an increasing interest in a wider range of symptomatology. Barr *et al.* (1938) mention irritability, dizziness, headaches, retardation and depression. Mortell (1946) quotes a case of progressive personality deterioration associated with idiopathic tetany. Lyle (1949) lists as "vague or accompanying" symptoms of tetany the occurrence of fatigue and muscular weakness, general nervous irritability, and mental retardation.

Psychotic reactions are also recorded during the past decade. Gotta and Odoriz (1948) described 14 cases of hypoparathyroidism, of which two exhibited psychotic episodes. Greene and Swanson (1941) in their paper "Psychosis and Hypoparathyroidism" referred to the previous work of Barrett and others, and suggested that such disorders may be commoner than generally recognized. During the course of nine years they encountered in one hospital 18 patients suffering from hypoparathyroidism, of which no less than five developed definite psychoses. These cases were all post-thyroidectomies, and the mental aberrations which they exhibited were regarded as forms of "toxic delirium," although no specific type could be identified. The description of the clinical findings in three of these cases certainly supports the diagnosis of an acute organic reaction. In the remaining two the most prominent features appear to have been paranoid in type, and distress associated with well-defined delusions of persecution led to suicidal attempts. These authors also mention that anxiety, depression, and a sense of impending disaster are common in tetany, although rarely of sufficient intensity to be classified as psychotic symptoms. Of particular interest are their observations on the course and prognosis of the psychosis in post-operative tetany. They found that the psychosis generally develops in the first 3–4 months, and may be as early as a few days after thyroidectomy. They also point out that a psychotic reaction may be the first and only manifestation of tetany, which might remain unrecognized unless confirmatory evidence is sought. In this respect they regard Chvostek's and Trousseau's signs and the serum calcium level as the most reliable criteria. Greene and Swanson considered that the prognosis in these post-operative psychoses is good. The remission of the psychological symptoms is usually delayed, however, for several weeks after the restoration of normal serum-calcium levels and the alleviation of the somatic manifestations. Furthermore, the improvement in the patient's mental state is a gradual process which takes 3–4 weeks to effect. Once achieved, mental stability appears to persist even under adverse conditions. It is emphasized that a recurrence of the physical components of tetany is not associated with reappearance of the psychological symptoms. In this series of five patients three developed further attacks of tetany when they neglected maintenance treatment, but no concomitant mental disturbances were reported.

While the majority of the cases of psychosis associated with tetany described in the literature have fallen into the organic reaction types with typical manifestation of acute confusion, other forms have been observed. Our patient showed no symptoms of a confusional state, and her illness was a typical paranoid reaction with a well-defined delusional system. To what extent the form of her psychosis was determined by basic personality traits is uncertain, but the nature of her somatic disturbances may have been significant. Her general state of ill-health, together with such symptoms as paraesthesia, could readily be rationalized into the delusion that she was being poisoned. The secondary elaboration of her delusional pattern may have been related to preoccupation with financial worries.

While these speculations about the more superficial psychopathological aspects are of some interest, the relationship of tetany to the psychosis remains the main issue. It is impossible to be dogmatic in the absence of confirmatory findings, but it seems reasonable to suppose that hypoparathyroidism was responsible for the fatigue syndrome developing immediately after thyroidectomy, and which persisted until the correct diagnosis resulted in appropriate treatment. The alleviation of this fatigue was by far the most obvious and direct response to treatment. The course of the psychosis, both in its inception and gradual resolution, is much more difficult to relate to underlying biochemical anomalies. Compared with other post-operative hypoparathyroid psychoses, the most unusual feature of our case was the prolonged latent period. A more immediate reaction, irrespective of type, as described by Greene and Swanson is easier to correlate with a metabolic disorder produced traumatically. A state of chronic undiagnosed tetany had, presumably, existed over a prolonged period in our case. The summation of the original and persistent symptomatology, together with the physical and psychological effects of the subsequent complications, must have led to a progressive lowering of morale and resistance. The precipitating situation involved not only increasing anxiety but also physical deprivation (diet). The alleviation of these factors by hospitalization probably restored the balance psychologically and metabolically to a sufficient degree to promote a gradual remission of the psychosis. The more direct and still reversible manifestations of tetany were subsequently relieved in a convincing manner by re-establishing a normal serum-calcium level.

It would appear, despite some claims to the contrary, that hypoparathyroidism does not result in any more specific psychological disturbance than is the case in myxoedema. Asher (1949) pointed out the variability of the psychotic pattern which may be associated with hypothyroidism. He also took pains to demonstrate that the syndrome of " myxoedematous madness " could only be distinguished by proof of the existence of myxoedema, and not by the form of the psychiatric symptoms in any particular case. Some of our patient's symptoms, such as her fatigue and dullness, might suggest that hypothyroidism rather than hypoparathyroidism was the underlying organic factor. Fortunately, however, there is sufficient evidence to dismiss this possible complication. In 1949 her B.M.R. was found to be within normal limits. While in this hospital a normal blood cholesterol was recorded, and of even greater significance is the fact that her psychosis remitted without the administration of thyroid.

Somatic Manifestations.

Manifestations of tetany in its acute form are mainly those resulting from increased neuro-muscular excitability. Typically painful muscular spasms result, affecting both the upper and lower extremities, but particularly the former, in which a " main d'accoucheur " deformity is produced. Spasm may occur in other parts of the body such as the abdominal and thoracic walls, the facial muscles (" carp mouth ") and the larynx. Laryngospasm is one of the common forms of local tetany, and is said to be peculiar to tetany of rachitic children, in whom the attack is sudden and severe owing to the abrupt closure of the glottis (" laryngismus stridulus "). Lesser degrees of laryngospasm may account for momentary loss of speech in adults, as experienced by our patient.

If a typical attack of spasm is witnessed the diagnosis may well be self-evident, but in the intervals between attacks, or in latent tetany, the essential neuro-muscular disturbances may have to be elicited by appropriate methods of stimulation (Trousseau's phenomenon, Chvostek's sign, etc.).

Subjective sensory disturbances such as attacks of numbness or tingling in the extremities may be a minor but nevertheless significant symptom preceding the development of muscular spasm. Attacks of this sort first made their appearance soon after thyroidectomy in our case.

In long-standing hypoparathyroidism, whether idiopathic or post-operative in origin, overt evidence of tetany may be minimal and limited to rather vague and isolated symptoms. Nevertheless severe structural changes are liable to develop insidiously and progressively in organs and tissues of ectodermal origin. Cataract is perhaps the most important defect which may arise. The course of events suggests that the development of lens opacities due to deposition of calcium is a late manifestation of chronic hypoparathyroidism. In a series of post-operative tetanies Bell and Bartels (1951) found that two years was the usual time which elapsed between thyroidectomy and the appearance of cataract. While the onset of this latter process may be delayed, it is rapidly progressive, as in our patient, whose vision first began to fail three years after thyroidectomy and who was virtually blind eight months later.

Trophic changes of the skin, hair, nails and teeth have been described (Bell and Bartels, 1951 ; Emerson, 1941). The skin is often dry, coarse and scaly ; the hair of the head and body is patchy and thin, and the eyebrows are sparse. The nails may show ridges and the teeth become discoloured and irregular. In cases of congenital hypoparathyroidism dentition may be delayed and exhibit deficient enamel formation. Sclerosis of bone has also been reported, but Berezin and Stein (1948) and Lyle (1949) regard absence of skeletal changes as more characteristic. No skeletal changes were found in our case.

Epilepsy and Electroencephalographic Findings.

Before discussing the import of the E.E.G. changes one is led to consider the relationship of epilepsy to hypocalcaemia. The incidence of epileptic fits in patients suffering from hypocalcaemia has been reported many times in the literature and has been variously explained.

The onset of the fits in those patients developing post-operative hypoparathyroidism is variable. In one case it is reported as having occurred the day following operation, in others years later, and most often after symptoms of tetany have become manifest.

Taubenhaus and Engle (1945), in a case which they described, concluded that epilepsy and tetany were coincidental and that hypocalcaemia is one of the factors precipitating epilepsy. Gotta and Odoriz (1948) came to a similar conclusion. Bell and Bartels (1951) mentioned cerebral calcification as associated with convulsive disorders in their review of post-operative parathyroid tetany, while Mortell (1946) described a case with fine stippled calcium deposits in the region of the basal ganglia. Mortell, Berezin and Stein (1948) and Barr *et al.* (1938) all mentioned the presence of raised intracranial pressure in cases they described, and the last authors were inclined to attribute the incidence of cerebral manifestations to a high C.S.F. pressure.

In our own case there was no personal or family history of epilepsy. At no time did the E.E.G. show changes specific for idiopathic epilepsy and there seems no sound reason for assuming that the patient had a " predisposition " to epilepsy. On the contrary, the E.E.G., from being only borderline abnormal when first recorded in 1949, steadily deteriorated during the course of the illness until treatment with calcium salts and calciferol had been in progress for some time. The epileptic attacks were infrequent, and can hardly of themselves be implicated as a cause for the deterioration of the E.E.G. The chief features of the serial E.E.G. changes were the progressive slowing and disruption of the alpha rhythm with increasing incursion of slow-wave activity into the record. Following treatment these abnormalities gradually subsided. This suggests an organic change in the cortex of a reversible type, becoming increasingly severe with the duration of the untreated illness, and slowly improving after the restoration of the level of serum calcium to a more normal figure. The slow alteration in the E.E.G. and the lag in its changes relative to the serum-calcium level seems to indicate that the latter is not the final factor in determining the E.E.G. abnormalities. It may be that the brain cells suffer from nutritional or circulatory deprivation as a consequence of a continuing low calcium or parathormone level in the blood, and that the abnormalities are not immediately righted by the restoration of normocalcaemia.

A striking feature of this series of E.E.G.s is their greatly heightened sensitivity to hyperventilation. Odoriz *et al.* (1943) made similar observations. It may be that some loss of the ionizable calcium fraction due to alkalosis has a greater effect on the function of nervous tissue where the level of blood calcium is already critically low. However, it is interesting to note that in our patient the E.E.G. instability to hyperventilation (delta response) displayed a considerably delayed improvement after treatment had restored the serum-calcium level. This fact lends more support to the idea that the nerve cells in the brain had undergone some reversible change due directly to, or associated with, the hypocalcaemia. When then subjected to the compensatory vasoconstriction of the cerebral arterioles which follows induced hypocapnia, such nerve cells may more readily give rise to abnormal rhythms.

Schwab *et. al.* (1941) found that in epileptic patients the delta response to hyperventilation was modified by anticonvulsants, and that the degree of modification was a measure of the efficacy of the anticonvulsant. Diminished delta response following restoration of normocalcaemia in tetany appears to be an indication that the epileptic threshold has thereby been raised.

The most severe psychotic symptoms in our patient occurred while the E.E.G. picture was showing progressive deterioration, and the only feature which was limited in its duration to the psychotic phase was the occurrence of fast-wave activity in the central region. The fact that further deterioration in the E.E.G. took place following the remission of the psychosis suggests that the psychosis was not strictly a " toxic delirium," even though it may have been precipitated by organic changes in the central nervous system. This is borne out by observations on the symptomatology, and is consistent with the remarks made by Greene and Swanson (1941), who, on clinical grounds, suggested that the psychosis in hypoparathyroidism is due to a failure of adjustment of the cerebrum to the acute chemical changes.

The part played by raised intracranial pressure in the production of the cerebral manifestations of tetany must remain in some doubt. Unfortunately in our own case no recordings of C.S.F. pressure were made, but it was noted that the optic discs at one stage showed evidence of papilloedema which subsided after treatment of the hypocalcaemia. Some of the E.E.G. appearances, while by no means specific, are consistent with raised intracranial pressure. In a number of cases described in the literature the C.S.F. pressure has certainly been raised, and Berezin and Stein (1948) go so far as to stress that hypoparathyroidism should be considered in the differential diagnosis of suspected cerebral tumour. In considering the dynamics responsible for the elevation of intracranial pressure in tetany, we feel that it would be interesting to have further observations on the relative concentration of calcium and phosphorus in the blood and C.S.F. Barr *et al.* (1938) noted in one of their cases that the concentration of calcium in the C.S.F. was normal both before and after treatment, and suggested an osmotic mechanism as responsible for cerebral oedema and raised intracranial pressure. An attempt at conservation by the blood-brain barrier of the calcium ion in order to obtain chemical homeostasis in the C.N.S. might thus be demonstrated as the causal factor.

TREATMENT.

In view of the nature of our case, discussion on forms of treatment has been restricted to the control of hypoparathyroidism. The aim of treatment is naturally to restore and maintain the level of the serum calcium to within the physiological limits of 9–11 mgm. per cent. For the immediate relief of tetany the direct injection of soluble calcium salts into the blood-stream has an obvious rationale. Dunlop *et al.* (1946) recommend 10–20 c.c. of a 20 per cent. solution of calcium gluconate for this purpose. While this may achieve a transient effect, the maintenance of calcium levels must involve a fundamentally different approach. The use of an active parathyroid extract would appear to be the physiological remedy, and indeed preparations such as Parathormone have been employed. A single intramuscular injection of up to 100 units will raise the serum calcium in a matter of a few hours, but the effect is not sustained for longer than about eighteen hours. While this procedure may be repeated, it has obvious disadvantages as a maintenance measure. It involves repeated injections, which are both inconvenient and costly, and it has been shown that the therapeutic effect diminishes with continued administration due to the development of an anti-hormone. The use of Parathormone is now probably confined to the immediate treatment of acute post-operative tetany following thyroidectomy or the removal of parathyroid tumours. In such circumstances a single injection may be given to supplement the initial parenteral calcium therapy, in order to overcome a post-operative crisis.

The maintenance treatment of hypocalcaemia is now effected almost entirely by the administration of one or other of the activated sterols. These substances are derivatives of cholesterol or ergosterol. Calciferol (vitamin D_2) and the intermediate dihydrotachysterol (A.T.10) are obtained from ergosterol, and the naturally occurring vitamin D_3 from 7-Dehydrocholesterol. The exact mode and range of action of these various substances is still a matter of conjecture. The vitamin D complex facilitates the absorption of calcium from the gut and finally promotes bone mineralization (anti-rachitic action) (Cameron, 1945). On the other hand, Dihydrotachysterol has only a feeble anti-rachitic effect, and its action in calcium metabolism is probably allied to that of the parathyroid hormone (Micks, 1947). Another aspect of the problem is that vitamin D in massive doses also appears to have a parathyroid-like action which thereby enhances its efficacy in the treatment of tetany.

The practical aspects of the treatment of hypoparathyroidism are discussed by Himsworth and Maizels (1940), who compared the effects of Parathormone, Dihydrotachysterol (A.T.10) and vitamin D. Their observations were mainly concerned with assessing the relative potency of A.T.10 and vitamin D. They concluded that the level of the serum calcium could be effectively controlled by either group, but that vitamin D was more reliable because of the constancy of the established maintenance dose. In this respect vitamin D_3 was simply equivalent to vitamin D_2 (calciferol), and the maintenance dose of either substance was 500,000 i.u. weekly. This was approximately the same dose as required by our patient, and also corresponds with the range of 50,000–150,000 i.u. daily quoted by other authors. A preparation of calciferol in oil was preferred to the tablet form by Himsworth and Maizels, who suggest that the latter may deteriorate or be less easily absorbed. During the course of their investigations these authors also experimented with doses of calciferol much in excess of the ordinary therapeutic range, and found that 1,500,000 units daily raised the serum calcium to 12·2 mgm. per cent. in two weeks. The drug was then omitted and a storage mechanism was suggested as the calcium level remained around 9 mgm. per cent. for a period of three months, and did not fall to a symptomagenic level for a further five months. It was observed that signs of tetany were consistently absent when the serum calcium was above 7 mgm. per cent., and that epileptic attacks never occurred unless the level fell below 5·5 mgm. per cent.

The therapeutic aim is to raise the serum calcium to a level which prevents symptoms without exceeding the physiological range (9–11 mgm. per cent.). The latter stipulation is of some importance, as Himsworth and Maizels are of the opinion that symptoms previously attributed to hypervitaminosis are in fact the direct outcome of hypercalcaemia. This contention is supported by our own observations in a case of sarcoidosis being treated with calciferol, in which a state of dull stupor had developed necessitating the patient's admission to hospital. The serum calcium was found to be 13·7 mgm. per cent. and calciferol was therefore discontinued. Subsequent reduction of the serum calcium to within physiological limits (9·6 mgm. per cent.) was associated with marked clinical improvement.

The treatment of hypoparathyroidism by oral calcium can be summarily dismissed. There is no real evidence that increased calcium intake alone can affect the course of tetany. The supply of calcium can only be an adjunct to other forms of treatment, and probably there is no advantage to be gained by giving excessive doses. The minimum daily dietetic intake for an adult is contained in a pint of milk (Micks, 1947), and this, by itself, will probably furnish an adequate supply providing that absorption is ensured. Most workers, however, advocate supplementary calcium (e.g., calcium lactate) as a precaution against possible dietetic deficiency.

SUMMARY AND CONCLUSIONS.

The aetiology, symptomatology and treatment of psychological disturbances associated with tetany have been discussed, and an illustrative case of post-operative hypoparathyroidism has been described.

A survey of the literature has revealed a wide range of psychiatric conditions which may be encountered. They include a variety of psychotic reactions of which the acute organic type figures prominently, but by no means exclusively.

Attention is particularly drawn to symptoms of a vaguer nature, especially chronic fatigue, which may precede or accompany any major breakdown. A case displaying these symptoms should be carefully investigated, as individually they are apt to be dismissed as relatively unimportant items of functional origin. Furthermore, these minor somatic disturbances, or a psychiatric syndrome, may be the only presenting features of an otherwise latent tetany.

With a history of thyroidectomy any subsequent undetermined symptomatology should certainly demand the exclusion of tetany. The diagnosis can only be clinched by a serum calcium estimation. This, in fact, is strongly advocated as a routine measure in the follow-up of all thyroidectomies. Once hypoparathyroidism is diagnosed it is a relatively easy matter to control, but if allowed to become chronic may not only lead to prolonged ill-health, but result in the three-fold disaster of epilepsy, blindness and insanity which befell our patient.

The significance of epileptiform convulsions in tetany has been discussed both in relation to E.E.G. findings, and to the raised intracranial pressure and papilloedema which may be present. Convulsions, raised intracranial pressure and papilloedema might easily suggest a cerebral tumour, and hypocalcaemia may legitimately enter into the differential diagnosis of space-occupying lesions. While raised intracranial pressure may be a factor in the E.E.G. abnormalities, in our case at any rate the changes were more indicative of a reversible metabolic encephalopathy. An interesting lag phenomenon was noted in the E.E.G. records of our case. While the psychosis was remitting the E.E.G. continued to deteriorate, and did not improve until some time had elapsed after the restoration of normo-calcaemia.

We wish to thank Dr. W. McCartan, Physician Superintendent, St. Francis Hospital, for permission to publish the case-record. We are also indebted to Mr. R. F. Nunn and to Mr. G. Johnson for the biochemical estimations and E.E.G. recordings respectively.

REFERENCES.

ASHER, R., *Brit. Med. J.*, 1949, ii, 555.
BARR, D. P., *et al.*, *Trans. Assoc. Am. Phys.*, 1938, **53**, 227.
BARRETT, A. M., *Amer. J. Insanity*, 1920, **76**, 373.
BELL, G. O., and BARTELS, E. C., *Lahey Clin. Bull.*, 1951, **7**, 105.
BEREZIN, S. W., and STEIN, J. D., *J. Pediat.*, 1948, **33**, 346.
BRAID, F., *Brit. Med. J.*, 1951, i, 1171.
CAMERON, A. T., *A Textbook of Biochemistry*, 1945. London, p. 57.
DUNLOP, D. M., *et al.*, *Textbook of Medical Treatment*, 1946. Edinburgh, p. 374.
EMERSON, K., *et al.*, *Annals of Internal. Med.*, 1941, **14**, 1256.
GOTTA, H., and ODERIZ, J. B., *J. Clin. Endocrin.*, 1948, **8**, 674–686.
GREENE, J. A., and SWANSON, L. W., *Annal. Internal. Med.*, 1941, **14**, 1233.
HIMSWORTH, H. P., and MAIZELS, M., *Lancet*, 1940, i, 959.
LYLE, D. J., *Amer. J. Ophthalm.*, 1949, **32**, 1183.
MICKS, R. H., *The Essentials of Materia Medica*, 1947. London, pp. 232, 240.
MORTELL, E. J., *J. Clin. Endocrin.*, 1946, **6**, 266.
SCHWAB, R. S., GRUNWALD, A., and SARGANT, W. W. *Arch. Neurol. Psychiat.*, 1941, 46, 1017.
TAUBENHAUS, M., and ENGLE, H. M., *ibid.*, 1945, **5**, 147.
WERTHAM, F., and WERTHAM, F., *The Brain as an Organ*, 1934. New York, p. 134.

THE RESPONSE OF THE NEUROTIC PERSONALITY TO ABREACTION.

By Anthony Hordern, M.B., Ch.B., D.P.M.,
Claybury Hospital, Woodford Green, Essex.

[Received 8 April, 1952.]

The purpose of this paper is to draw attention to results achieved in selected neurotic cases treated by short-term abreactive techniques in St. Clement's Hospital during recent months. Patients usually stay in for about two months ; as yet it is too early to assess long-term results of this form of treatment, but it is felt that some of the initial results are extremely encouraging.

Abreactive techniques are administered either as a substitute for psychotherapy, or alternatively as a short cut and an adjunct to psychotherapy. In most of the cases treated at this hospital abreaction has been performed with the latter intention in view. There is also reason to believe that abreaction, i.e., satisfactory complete discharge of emotional tension, may in many cases effect a symptomatic improvement in a non-specific manner analogous to that of modified insulin. This suggests possibilities in the treatment of chronic tension states ; one wonders whether a monthly abreaction would benefit them on symptomatic grounds through discharge of their tension. Often these cases are inaccessible through their personalities to even the most patient of psychotherapists. Might it not be that abreation could provide an answer to the psychotherapist's dilemma ? Abreactive therapy has the inestimable advantage of providing actual tangible " treatment " associated with a preparation and a ritual—all of importance to the avid neurotic. He will use it to bolster his importance and relieve his feelings untrammelled by his conscience. "The ether made me say that."

All psychoneurotic patients have or had at one time a drive towards normality and a desire to master their environment. These two basic human needs are the largest factors in treatment and eventual cure. Abreaction can leave the ground clear for them to emerge by detensioning the emotional forces which so often obscure the basic problems. However, poorly socialized withdrawn patients with frank wish-fulfilment reveries do not appear to benefit much from abreaction in our experience. There is an insidious danger in the delights of fantasy which many discover all too late if indeed they ever discover it at all. It is not, however, with these latter cases that we are immediately concerned.

Technique.

In general a mixture of chloroform and ether was used in the proportion of 1 : 2 parts. At first pure ether was used, but it was found that it had the disadvantage of making the patients cough if " pushed " too rapidly. In addition, if for any reason it proved desirable to get the patient into a deeper plane of anaesthesia quickly, it was virtually impossible to do so with ether alone. Atropine was not usually given beforehand.

At first rigid anaesthetic precautions were observed (tongue forceps, mouth gags, etc.), and the anaesthetic was dropped from a bottle on to a Schimmelbusch's mask on the patient's face. Artificial dentures were always removed, and in general one " prepared for the worst." J. B. Lindsay then introduced the technique of pouring the anaesthetic solution from a dropping bottle directly on to a towel laid across the patient's face. The towel is spread over the face and the nose is located with the finger-tip ; the anaesthetic is then dropped on to an area about 1 in. below the tip of the nose. The therapist can then place the ether bottle in his breast pocket and sit facing the patient on the couch beside him. His hands are free to control the patient's arms.

It was felt about this time that it was of importance that patients should have treatment with their artificial teeth actually *in situ*. Theoretically the patient should never attain a depth of anaesthesia at which respiratory obstruction and/or asphyxia from dental foreign bodies is to be feared. In practice there has been no difficulty on this score, and treatment is now given with the patients wearing their teeth. "Towel treatment" offers several advantages over the mask method. It is handy, easy to prepare and administer. The patient under the towel can cavort and struggle as vigorously as he likes. In addition, when necessary, the therapist can easily administer the treatment alone, having no need of a nurse or an anaesthetist; indeed, often patients greatly prefer to be alone with the analyst while chloroform : ether is administered. Pentothal abreaction which was used in one case is handicapped by an extraordinarily brief excitation period if the solution is not injected extremely slowly, and by the necessity for the patient to lie absolutely still while the drug is injected.

As a rule treatment is given with the patient lying on a couch, though male patients and strong women are better treated on a mattress on the floor. Strong patients can be extremely violent, a danger to themselves and others. At least two assistants should be present in addition to the therapist in these cases. Though the idea of padded rooms has crossed our minds on more than one occasion, because of the danger of patients hurting themselves, the room has such unpleasant mental connotations for most patients that it has never been used for this purpose.

One patient of the series described below was given pentothal abreactions on grounds of physical frailty. It was considered that the resulting abreactions were less successful than those employing routine chloroform : ether.

The first few abreactions are generally left for the patient to conduct. Some take several abreactions before they are able to overcome their resistances sufficiently to release their overt emotions, others do so at their first treatment. When the patient's immediate emotional problems have been worked through, specific suspected psychopathology can be investigated. For this purpose dreams are fertile soil. "Key figures" (Cameron), may be investigated, and questions can then be asked about the emotional problems which are invariably concerned with these figures. "What do you feel like when he says that?" "Do you feel angry?" "How angry?" "Show me how angry." "I'll bring him in." "Here he is." A patient will often abreact several times on the same subject passing eventually into the inhibition that Sargant (2) maintains is so desirable to attain. An adequate emotional abreaction can often be provoked by sound effects to mimic and amplify the dramatic effect of the original situation, e.g., dropping a tray may bring back an accident, or noise may act as an irritant trigger. The therapist becomes the loved or hated person for the patient; and the resentment and anger is worked off physically against him. As treatment proceeds fresh problems emerge and the patient should improve. Why they often do not is discussed later in this paper. Some patients seem to work off their resentment very satisfactorily against a "dummy"—they will strangle or bayonet a pillow that is thrust towards them at the right moment. Others find it difficult to localize their hostility in this way. They will say, "I'm fully conscious, doctor," though they are actually in a drowsy stuporose state and are amnesic afterwards. To some extent this seems to depend on "abreaction-sophistication," but this is not always the case.

Actual spacing of the treatment varies, but in general it is given twice weekly or oftener. The patient should not be given any intimation as to when it is to be performed, since the anxiety and consequent exasperation against the therapist often provokes a beneficially hostile reaction which may be used to good advantage during the treatment itself. It is important, however, to note that abreaction is in a sense "voluntary" and is analogous to hypnosis—patients will not disclose what they do not wish to disclose. This was demonstrated very forcibly in the case of a female patient with an enuretic husband. Under treatment she fought and screamed, "He's made me filthy." This was thought to be a reference to impregnation prior to marriage, but not until she diffidently and shamefacedly vouchsafed the information at an interview after some six abreactions was the true significance of the remark realized.

INDICATIONS.

Yeats talked of "fury and the mire of human veins." It is true to say that such emotional tension is the prime indication for abreaction, and the particular emotions constantly found as precursors and generations of this tension are grief, rage and fear. In our experience grief has often proved itself a composite emotion, constituted of pain and despair closely associated with anger against the person or object that removed the loved person or object. Rage is notoriously prone to conversion into fear as is widely known, and we have often found fear to be a fear of the anger within the psyche itself. When these feelings are associated with love and dependency and subjected to external stresses, it is easy to see the enormous ambivalences that are set up and the conflict that rages within the personality seeking outlet often in the only way which brings sympathy and credit into the patient—the escape into illness.

In passing, I should like to remark that though it is normal for a person to dislike and fear abreactive forms of treatment, a violent aversion, almost a " phobia," of abreaction is almost pathognomonic of the need for it. One patient who expressed this aversion was persuaded into two abreactions ; at the first she " swooned away " on a very small quantity of anaesthetic. At the second she became extremely violent, accusing her doctors of thinking her a " sex maniac " and abusing them roundly. She refused further treatment, but nevertheless improved after her outburst.

As well as the symptomatic relief it provides and the disclosure of new material which might have taken months to unearth by psychotherapy, abreaction can provide the patient with a degree of insight. This is attained through memory and through a subsequent " working through " of the material by the patient and the therapist. We feel this is very desirable. The logical extension to assist the insight attained through memory would seem to be recording of the abreaction and a subsequent session " playing it back." As yet we have not tested this idea.

Usually younger patients benefit more than older ones on the insightful level. Their personalities are not as strongly developed, and their defences are not as ingrained as their older contemporaries. Their defences may be circumvented to provide symptomatic relief through discharge of accumulated emotion, but their owners are far likelier to prove incapable of reorientating themselves in the manner desirable for complete recovery. For this reason it seems better to avoid abreaction if possible in elderly patients. In their case the question one asks oneself should not be, " What can I analyse ?" but, " Having dissected this person's emotions and shown them to her, how am I to help her to fit the pieces together again ?" If a person cannot face the truth it is perhaps better that they should be ill.

EFFECTS OF TREATMENT.

These may best be assessed under six headings as suggested by Koren, Goertzel and Evans (3) recently :

A. Has the ego been strengthened ?
B. Is more energy available to deal with the environment ?
C. Has more insight been attained by the patient ?
D. Has there been symptomatic relief ?
E. Does the patient still employ the same defences ?
F. Has improvement in sexual adjustment occurred ?

We have noticed several reactions to this form of treatment. Pathological aversion has already been mentioned. Of equal importance is pathological desire for it—" addiction." This may be countered by refusing treatment or spacing it out more widely. Treatment too can be modified if desired—the patient can be rendered completely unconscious or allowed to remain on too light a plane of anaesthesia. All these measures invariably seem to produce a beneficial effect since they all build up anger against the therapist, through frustration as well as a feeling of uncertainty and doubt. The relief of these feelings under treatment usually marks an improvement in the patient's condition.

Edkins (4) has pointed out in a recent article that the response to treatment usually involves three stages. There is a preliminary " false dawn " of considerable symptomatic relief. This is succeeded by a phase of recrudescence of symptomatology, e.g., patients may complain of the return of pain they suffered immediately after the precipitating shock which caused their breakdown. Lastly, there is a more gradual phase of recovery and in good cases the slow appearance of insight.

As treatment proceeds it is frequently noticeable that patients require considerably less anaesthetic before they abreact. This may be due to practice, or to more complete *rapport* with the therapist ; it may be due to dissociation. This last point is important, and demands consideration.

Dissociation is a form of defence mechanism constantly employed by the neurotic and by many normal people too. A refusal to accept the fact into one's own consciousness that one is prone to behave in a certain way is certainly common in abreacted patients, particularly the older ones. "The ether made me say that" they will allege. This of course is both an asset and a drawback. The asset lies in the sop to their consciences, but the drawback here is in the shutting out—voluntarily often—of that insight they need so badly. Probably only long-term psychotherapy can help patients with the dreadful problem of seeing themselves as others see them. Faced with the blinding realization of an abreaction many quail and refuse to look. One gets the impression, however, that perhaps they attain more insight into their feelings than they are often given credit for; this fact must be taken into account in the ultimate assessment of prognosis.

The dangers of treatment are (1) the precipitation of a psychosis (according to some authorities), (2) addiction, and (3) actual physical injury—to the patient or the nurses. Careful selection of cases should diminish the liability to the first danger, and in practice we have encountered no difficulties on this score. Methods of dealing with addiction have already been described; one must particularly beware of the patient who says "I don't like ether, I think it's most degrading, but . . ." One patient fractured a rib during treatment, which suggests that some suitable form should be signed prior to treatment regarding responsibility. There should of course be an adequate number of medical attendants to prevent such an emergency. An alternative suggestion—abreaction under curare—we have not yet tried. Binding the patient's limbs would seem to be contraindicated on the grounds of the relief attributed to the somatic discharge of emotional tension during treatment.

Illustrative Cases.

Space is too short to permit of a full case-history in many cases in this short paper. For this reason only the salient points of a few cases are presented. For convenience the cases are classified under three main headings: the Grief Reaction; the Rage Reaction, and the Fear Reaction. It will be appreciated that this is a very broad subdivision, and is based arbitrarily on the main impression the clinical symptomatology suggests, and on the precipitant emotional traumata. The three types of reaction shade imperceptibly into one another, and few have grief without rage or fear without impotent anger directed towards the frightening circumstance.

(A) Predominantly Grief Reactions.

Case 1.—Mrs. A—, a housewife of 61 years old, was admitted into hospital nine months after her husband's death in a car accident. A lorry ran into the side of the car and Mr. A—, who had retired only six days previously, was gravely injured and died in hospital a few days later. (Intercurrent infection consequent on complete transection of the spinal cord.) Mrs. A— saw him each day until he died and seemed to take the bereavement fairly well until a month later, when she began to feel restless and suicidal. She lost 2½ stones in weight, had initial insomnia and felt her "brain would snap." A month's continuous narcosis three months after the accident improved matters slightly but the condition relapsed and she was admitted to the hospital in early June. No compensation had been agreed on by this time.

On admission, the history showed that her father had died when the patient was 12 and the mother—a chronic invalid—when the patient was 25 years old. She and a twin sister were the youngest of a family of 14 children. She was sulky and nervous as a child and always mortally dreaded darkness. Followed a brief period of unhappiness at 5 in a private school and loneliness in a boarding school until she was 14. After a few years at home she became engaged and married her husband, going abroad with him for three years and returning in 1916. She had two children—a son who became an Army Officer and committed suicide in 1941, and a girl who is now a schoolteacher. There were a host of illnesses in addition—monthly attacks of migraine, a "breakdown" through "overwork" fifteen years ago, dysentery and diarrhoea in the Far East. As a child of 5 she had rheumatic fever but there was no cardiac involvement. W.R. and Kahn were negative.

She was described as being sensitive, diffident, conscientious, morally courageous and rather prudish. She read history books and had a good sense of humour but was prone to pick up her husband's moods. It was later discovered that she had never slept alone and that when her husband went away she would get her daughter to sleep with her.

She had dreamt that a black cat she loved dearly had been killed by a dog and left lying on the road with a broken back. Free association revealed that she was inordinately fond of cats and that her sister was going away and leaving the cats behind. In addition she had recently blamed herself for losing a valuable cat her daughter had left to her to look after.

It was felt that in view of her physical frailty pentothal should be used for abreaction. She was started on modified insulin and occupational therapy. On admission there was a great deal of *grande hystérie* with some considerable depressive colouring. The first abreaction was used to probe the dream and the dog was fairly easily identified with the lorry driver who killed her husband. She had had to " forgive " the driver because he was " so young " but she clenched her hands and rumbled " I hate him for he has ruined my life." There were also many tears for her husband and in addition a hard feeling in the stomach " like a clenched fist " which she admitted was anger for the driver.

During the next few days, four subsequent abreactions were given and the reactions were localized mainly into (i) Hatred for driver—" would like to kill him." (ii) Grief—mainly self pity—" he's ruined my life." (iii) Daughter resentment—blamed daughter for leaving the cat she had lost. On Cameron's classification the " Key Figure " seemed to be the driver and the compensation she sought was her own expression of her deep hatred for him.

After five abreactions the patient expressed marked depression and self blame though was notably less histrionic. Four E.C.T.'s were administered in two weeks but her condition was unaffected by them. By this time it had been decided that there was very little real depth to her feelings of grief, and that she was consciously exaggerating her symptoms. She was accordingly treated more firmly and this produced a beneficial result. Soon afterwards she went home for a weekend and did not return. Her daughter said she was behaving " terribly " but was not able to persuade her to leave home.

During her stay in hospital, hysterical histrionic behaviour was well marked although ideas of unworthiness and resentment against " the driver " appeared in the course of treatment. E.C.T. did not improve her but firm reassurance seemed to be well received. In view of her grossly dependent personality it was thought that the prognosis was poor. It was subsequently learnt that she had been admitted into a mental hospital, two weeks after discharge, as a certified patient. When she quitted the hospital the question of compensation still remained unsettled. One reflects that this patient in less complete marital security might well have become a florid, hysterical personality with well-marked traits of pseudo-invalidism.

Case 2.—Mrs. B—, a married brewery worker of 36, was admitted to hospital nine months after her brother's suicide. Her main complaints were anxiety and phobias of hurting her daughter.

Her father had been killed in the 1914–18 war and when the patient was 10 years old, her mother remarried to an alcoholic bargee who was violent at times. The patient never got on with her stepfather and her mother died, aged 48, in 1937. A—, the eldest sibling, hung himself in October, 1950, following concussion subsequent to a lorry accident. He was the patient's favourite brother. There was also a half brother and a sister who died at 3 when the patient was 7. She remembers this vividly. The home atmosphere was rowdy and unpleasant but there was no family strain of mental illness.

Mrs. B— was a robust child with a violent temper. She had phobias of darkness which lasted until school age. At school she seems to have got on well and was clever and alert. Leaving there she worked as a tailoress and then in a brewery ; she had several boy friends and married at 20 years. Her husband was an easy-going driver's mate and there was one child, a girl who is now 14 years old. The patient has done a lot for the daughter, who seems " saucy " and ungrateful at times.

Her personality was described as being quick tempered, domineering, unsociable at home and she was a poor conversationalist. She had a good sense of humour, was usually happy and optimistic with boundless energy. Soon after her brother's death she complained of precordial pain and formed the idea that she had gangrene of the legs. She had fears of destruction and anorexia with weight loss and initial insomnia. Six weeks before admission she began to picture her husband with a knife in his back. She had phobias of madness and sat about crying all day. She was dreaming of violence and funerals. Two E.C.T.'s as an O.P. did not help her much. Her husband said she had become very cold sexually.

Physically, she was a strong, healthy woman, but mentally she appeared very depressed and worried about her obsessions. She was of average intelligence and thought her illness was due to her brother's death and the rows she had had with people recently.

She was treated by modified insulin and abreaction with chloroform-ether. At the first abreaction she wept about her brother's death and displayed marked anger against her brother's wife who had treated him badly, although " he thought the world of her." She became violent about this and also about the neighbours who had pulled down a fence her brother had bought. She abreacted about 4 times on the sister-in-law, complaining between treatments of uncontrollable angry feelings and phobias of " split-mind "; she became very annoyed with her husband because he refused to take her home. The next abreaction was again very violent and the subject was the step-father who had mistreated her mother and (in fact or fantasy) made some mild sexual advances towards her. Two subsequent abreactions were directed mainly against the husband and consisted largely of anger. The final abreaction, however, dealt with the brother's death. It consisted of anger—" You bleeding fool, why did you do it ?", and tears. There was a strong element of shame and it became obvious why she could not bear to have the street door open at home and thought the neighbours talked about her.

Here at last emerged the " key figure." It was her brother himself who had finally rejected her by committing suicide. A day or two later she was complaining of precordial pain but soon appeared brighter and became more settled. A few days later she had decided that the illness was due to being " run-down " through " overwork." She would not admit any insight but was discharged symptom free. It was evident that she had intentionally or involuntarily completely dissociated her abreactive experiences.

In this patient's personality, the components of dependency and hostility were present, as they were in Case 1. However, the hostility component was by far the stronger of the two and dissipation of this feeling produced a good result. It was felt that the satisfactory outcome of this case was due to hostility > dependency in sharp contrast to Case 1 where the proportions were reversed. No satisfactory contest with the key figure was possible, but it was felt the re-expression of intense anger and shame during the last abreaction was immensely beneficial.

(B) Predominantly Rage Reactions.

Case 3.—Mrs. C—, a housewife of 32, was admitted to hospital complaining of anxiety, tension and phobias of people dating back several years but severe for three months.

She had had an unhappy home life as a child due to parental quarrels. The father, a war invalid with an amputated leg, died after many operations when she was 28; the mother was in mental hospital for six months when the patient was 13. An elder sister (now married) dominated her and took her away from home at 18, after a police court case against the father. She had little to do with two younger children.

From a sensitive, timid, weakly child she grew into an indifferent scholar. She would cry when the teacher left the room and abhorred games and fighting. Too ashamed of her home to take friends there, she was lonely and overshadowed always by her elder sister. On leaving school she worked in various shops and became a waitress, leaving home to live with her elder sister at 18. She married at 21, mainly because she liked her husband's parents; he, himself, had a psychoneurotic breakdown soon after entering the Army and was discharged in 1941. Sexually, the marriage was grossly unsatisfactory and intercourse was very rare, due to the husband's refusal to have children. She nursed her mother-in-law for a year before she died and looked after her sister's daughter for a year while the sister had T.B. All this was in addition to housekeeping and office work which she had started in 1942. She got on badly with her husband—there were no common interests—and money was short. Her father died in 1947—soon afterwards she became pregnant, on the advice of a psychiatrist to whom she went complaining of epigastric pains and phobias of people. Then she learnt a friend had cancer and aborted at three months. She went into hospital for six weeks' rehabilitation and after that she nursed the friend until she died and looked after her child afterwards. About four months after the friend's death, she became the friend's husband's mistress. This affair lasted a year, conducted surreptitiously; and she feels she is still in love with the man, and that this was a very wrong thing to do. Matters came to a head when her husband " raped " her twice and she left him to go back to the other man. She stayed with her sister then and went back into hospital for six weeks, slowed up, depressed and underweight. She was discharged improved, labelled " emotionally immature." Her husband had sold up the home by this time, so she returned to live with her sister. Recently she and her husband have been living with a friend and she has not seen the other man for some time. Though the husband is very considerate now and was prepared for a divorce, she has not had the courage to leave him for the other man. Lately, intercourse with her husband has been very repugnant to her and she has lost weight and become very irritable with his mannerisms.

On examination she was a thin, poorly developed attractive woman; she seemed composed and fairly cheerful and of above average intelligence. She appeared to have considerable insight.

She was treated by modified insulin, psychotherapy and abreaction. She gained weight rapidly. The first abreaction consisted mainly of tears about the unhappiness she was suffering—the " other man " figured largely in it. At the next abreaction, tears and father-hatred emerged—the father used to lead his own life to the exclusion of the mother and made her very unhappy. The third abreaction centred on her dislike of her husband and her repulsion of him sexually. All these abreactions were very flaccid affairs—she would only shake her head and refused to get angry. A little anger against her husband came out in the fourth abreaction. It was then decided that anger should be provoked if possible and expressed under ether. To this end " taunts " were levelled against her and she was frequently admonished with regard to her attitude. Two abreactions a fortnight later were almost totally unproductive of anything but tears. She rationalized her emotional inertia by saying " I don't want anybody to be hurt as I've been hurt."

She improved physically and one had the impression that she gained considerable intellectual insight. Unfortunately, she was a grossly dependent personality in whom hostility lies submerged beneath the pattern of years. She was too insecure and dependent to be able to express this hostility and she failed to make any real progress with her problems in which hostility played a major part. In this case the " key figure " seemed indeterminate, but probably was the husband, and not the sister of earlier days.

Case 4.—Mr. D—, a clerical worker of 33, was admitted complaining of depression, tension and intense pain in the site of an appendicectomy scar which was two months old.

In his early days his father, who was a labourer, had knocked him about when drunk and had locked him out of the house on several occasions purposely. This first happened to the patient at the age of 8. His mother died of tubercle when he was 6 and he only saw her three times. The father re-married when the patient was 17. He and his sister were brought up by strict paternal grandparents ; the grandfather drank and was violent. There was little affection in the home. No other abnormal personalities or mental illnesses were traced in the family.

As a child the patient had tantrums and darkness-phobias ; he was claustrophobic and still is. He did fairly well at school, leaving at 14 to work in a paper mill. While there he had concussion from a broken belt which lasted three weeks. He was unhappy and seclusive and moved into lodgings when his father re-married. In November, 1939, he joined the Army and had seen seven months' service in Egypt when he was wounded in a shell burst. Of 8 men in a pit, 2 were killed and another was wounded besides him. He was concussed and had a dislocated shoulder. In and out of various military hospitals for 2½ years he was finally discharged with " neurosis " in September, 1943. He had headaches and blackouts—at this time " could hardly see." After a holiday he got a job in plastic works in 1944, living in " digs," but was discharged in 1948 because of a difference of opinion with the foreman He had always found sexual matters rather coarse and had only one extra-marital experience. He married in August, 1945, but it was sexually unsatisfactory and they separated after a year. " Mental Cruelty " failed as grounds for divorce, but two years later he got a decree. He has now been married to his second wife for three years but there have been no children and he has derived no sexual pleasure ; recently relations with his wife had been deteriorating—they lived in two rooms and he would get worked up and knock her about, regretting it afterwards. He drank little but smoked 25 cigarettes daily. Recently he had been working as a manager in a factory.

He was interested in football and repertory, reserved, shy and irritable. He found difficulty in self-expression—" It tangles up inside me, it just won't come out." He read " bloodthirsty sexy books " (wife). He was usually solemn, irresolute and sometimes depressed. In three months he lost 1½ stones of weight and began to suffer from initial insomnia. He became jumpy and claustrophobic, developed hypochondriacal fears of catching infantile paralysis and took to swallowing tablets prophylactically. He refused to be reassured, spent hours on long walks and admitted he had become so depressed that he was contemplating suicide.

On examination he was a large, healthy, worried-looking man. He seemed anxious and on edge. He was " tongue-tied " and said he had to pinch his leg to make sure it was there. His intelligence was good and he said the trouble was " mentally deeper than a cut finger."

He was treated by modified insulin and abreaction. The first ether session was filled with sobbing and rage, mainly against his wife who " didn't understand him," and cast aspersions on his manhood when he was disinclined for intercourse. He was afraid he might kill her. The next abreaction was abortive as the patient was scared. It was discovered then that his first marriage was never referred to by either of them. During the third session and two subsequent ones, intense father hatred, accompanied by much violence, was manifested. He said a small black ball was growing bigger and bigger, and that it might be anger. He felt that he was annoyed with his wife because she nagged him as his father had used to do. As well as an intense anger against the father for his earlier treatment of him there was a more recent anger component in the father's refusal to accept his (the patient's) second wife.

He improved mentally and physically. It was felt that the key figure was primarily his father and the dissipation of resentment towards him helped the patient tremendously. He began to see that he was afraid his wife might "lock him out of affection" as his father had once locked him out. He soon lost all his tension and sexual relations with his wife improved. He was discharged from hospital symptom free, with a fair degree of insight.

In this personality hostility exceeded dependency. Dissipation of hostility against the key figure achieved a good result in a manner analagous to Case 2.

(C) Predominantly Fear Reactions

Case 5.—Mr. E—, a clerical worker of 44, was admitted to hospital complaining of intense headaches and depression for 10 years; he had been off work for seven weeks.

In childhood he was brought up, together with his sister, by an uncle who lived in Ireland. His father, a Merchant Navy officer, brought him to his brother from Africa when he was 6. His mother died when he was young; he did not know her. All the family had been fairly high-ranking Army officers.

At school he said he was remarkably popular and had many friends due to his prowess at games. Scholastically he was "latent." He returned to Africa at 13, leaving school at 15 to enter an iron foundry. He disliked this and was on bad terms with his father and stepmother with whom he was living at the time. (His sister said that actually he was an indifferent scholar and had never made friends; the trouble with the stepmother was largely his fault). Leaving the iron works he worked in a variety of jobs until he was 23—a clerk in a flour mill, cinema projectionist, worker for G.P.O. cables, etc. In 1930, his sister got him back to England and gave him a wireless training and he went to sea as a radio officer in 1931. He was at sea until 1941, latterly on the African lines; though he says he was happy and popular, his sister does not confirm this story.

He married at 32, in 1938, a woman who was 39 and was said to be immature and frigid. It was a failure in every way and ended up in a divorce on "Mental Cruelty" two years ago; he pays her 10s. 0d. weekly if he is earning more than one third of the joint income. There were no children. In 1941 he was blown up in a liner and was trapped first below decks and then clinging to the deck after the others had taken to the boats. He seems never to have recovered from this, for since then he has been "an utter nervous wreck." After anxiety symptoms on subsequent trips, he was discharged with 40 per cent. pension in 1945. He did clerical work for three years, 1947 to 1950, with three months off yearly; a recent job in a store was lost due to headaches and faulty concentration.

In 1947 he had 5 E.C.T.'s as an out-patient and was in hospital soon afterwards where he was evipan abreacted and rehabilitated for nearly a year with considerable improvement. He returned to clerical work but the "climax" came in March, 1950, when he was dismissed. He developed diarrhoea, headaches, etc. A little better while he worked in the store, he has been going to pieces again slowly, feeling suicidal, very resentful about everything, failing to get off to sleep and losing weight.

On examination he was a thin, round-shouldered, cultivated man with haemorrhoids. Though conversant with his environment, he was at pains to impress one with (*a*) his difficulties—"the intolerable agony of my head," and (*b*) his personal fortitude in his reaction to them—"I carried on, I wouldn't give in," etc. He had no real insight into his condition and his judgment was poor.

He improved physically on modified insulin and superficial psychotherapy. The first abreaction was literally a roar of woe. He howled "nobody understands me." A second abreaction started similarly and developed violently against a man he had met in a cookery course he had taken. After it he whimpered and became difficult to manage. The next abreaction was extremely violent—roaring and rage against the nurse who "managed" him. At the fourth abreaction he displayed slight fear with reference to his shipwreck; and very violent hostility against his wife who used to slap his face and say "you bloody fool." This obviously rankled and he became mightily worked up, so much so that he fractured a rib (confirmed radiologically) which prevented further treatment by this method.

His tension lessened perceptibly during and after the abreactions but he rapidly relapsed when they had to be discontinued. He was soon complaining of his head again and it became obvious he had no intention of obtaining a job in which he would have to pay his wife the 10 shillings weekly alimony by earning more than £6 weekly. He was discharged symptomatically a little better.

It was felt that this was a difficult case from the start since the patient was, in effect, an inadequate psychopath. In his personality his hostility, though violent, was matched by his dependency. Illness provided a means of discharging his hostility to his wife who was the "key figure." The expected and actual outcome of treatment was poor.

Case 6.—Mr. F—, a clerical worker of 43, was admitted from an observation ward to which he was brought depressed and suicidal.

As a child he had idolized his father who was an upright man and died in 1927; the mother was a kind and a homely soul. The patient was the third sibling of seven; a younger sister is mentally backward from chorea. The home atmosphere was generally settled and secure; but patriarchal.

Always healthy, he was a nailbiter, and would stand his ground "to the point of absolute obstinacy." He was popular at school and did well there, boxing and playing soccer for the school which was a secondary technical one. He became a book-keeper at a warehouse and after fourteen years had reached a position as secretary there. Sexually shy always, he married a wife who developed asthma when intercourse occurred; she opposed his desire for children and spent all her time with her sisters to his great annoyance. Their interests did not coincide and by 1935 he was making the best of a bad job, regarding her as "an absolutely reliable housekeeper." He spent his time in organizing boys' clubs, etc., since he had no children of his own.

When war came he volunteered for the A.F.S. and later for the Army. He was soon sent to the Far East, thereby losing his chance of a commission. Arriving just prior to the fall of Singapore, he was captured there after the retreat through Malaya. Followed a period of incredible hardship from June, 1942, to May, 1944, when he worked on the Death Railway (1 in 5 survived) surrounded by starving and diseased companions. One Japanese officer, T—, was directly responsible for decapitating many of the troops and causing the death of one of the patient's friends as well as beating the patient up. After a nightmare journey to Japan in an overcrowded troopship, he was shipwrecked due to American bombing—and spent a further dreadful year as a worker in heavy industry in Japan. The physical and mental hardships of this time are indescribable; and the patient came through them sustained by (i) his love of his wife and (ii) his hatred of the Japanese, exemplified by T—, the Japanese officer.

At home again with different ideals he attempted to adjust himself to the post-war profiteering, not-too-honest attitude of his wife's relations. Appalled at what he found, he took a poorly paid job as a clerk; but his wife left him in 1946, saying he was impossible. All his attempts at reconciliation proved fruitless; in his depression he drifted from job to job unable to settle. The final blow came when the Peace Treaty was signed; in that instant, all he had fought for and was still contesting (P.O.W. widows' pensions) became invalidated. He went to the Ministry of Pensions threatening suicide and was admitted to hospital. He complained of initial insomnia and an inability to enjoy anything any more.

On examination, he was rational, intelligent and co-operative; physically he was free of disease. Abreaction was decided upon and the first one was interesting: he said "Agua" several times and rolled into a contorted position on his side. At subsequent abreactions this posture recurred—it was eventually discovered that it represented his defensive posture when kicked into the "guard kennel" by the Japanese. "T." was abreacted on violently and the patient strangled and bayoneted a pillow several times with considerable relief of tension. After 5 abreactions, his responses were more flaccid and less easily aroused; he said he felt less tense. He revealed that he had not initiated divorce proceedings against his wife in case further unhappiness might ensue; and it became apparent that a hostility—dependency problem was emerging. The hostility had been almost wholly externalized on to the Japanese, and abreaction relieved this in some measure. The dependency problem remained; this was to be dealt with by psychotherapy. It was felt that the prognosis was not unfavourable because of the way in which this patient had stood up to quite extraordinary stresses in the past. While under treatment he wrote a play; the theme concerned an innocent man punished for a crime, who served a sentence and then, released at last, committed the crime which he had already expiated. He began to see, however, that society's debt to the innocent man did not condone the perpetration of another crime, and gradually began to attain more insight thereby. He was discharged a little better.

COMMENTARY.

It would of course be possible to postulate several varieties of psychopathology in the few cases outlined above. In at least four of them, unsolved, sibling rivalry and sibling dependence would seem to play a part. This becomes a very real problem when the key figure is actually the feared sibling or a personification of that person. If the key figure can be projected on to the analyst in a transference situation—and abreaction facilitates this process—a better outlook is assured when it finds expression against him.

It must be remembered too that hostility may be introjected forming guilt feelings and depression, or, extrojected into paranoid ideas and delusions. The former mechanism would seem to argue a better type of personality reaction than the latter, and one would anticipate a better therapeutic result.

In comparatively few cases was Sargant's stage of complete inhibition reached, nor was it considered necessary to push the patient to that point. Adequate release of emotion was attained often at an earlier stage, but it was found that neither the aggression nor the dependency of the aggressive and inadequate psychopath respectively was greatly altered by their promulgation in abreactive treatment.

Suttee (5) talked of separation-anxiety. In these few cases and others treated here recently, another facet of this problem seems to emerge ; that of dependency : hostility—a common result of separation anxiety in a personality under stress. It is felt that the relative proportion of dependency to hostility by clinical assessment in the personality of the patient is of some prognostic significance. The following table makes this clear :

Type.	Case.	Previous personality.	Hostility.	Dependency.	Expected prognosis.	Result on discharge.
Group A	1	Fair	++	++++	Poor	Poor ; slightly improved.
	2	Good	++++	++	Good	Cured of symptoms ; no real insight.
Group B	3	Fair	+	++++	Poor	Poor ; slightly improved.
	4	Good	+++	++	Good	Much improved.
Group C	5	Fair	++++	++++	Poor	Poor ; slightly improved. Disease revenge.
	6	Good	+++	+++	Fair	Improved.

SUMMARY.

The indications for abreactive treatment are discussed and an abreactive technique is described.

The effects of this form of treatment on the disease, and the side effects on the patient are listed.

Six typical cases treated by abreactive therapy are discussed in detail, together with a note on their probable psychopathology.

It is suggested that the ratio of the hostility : dependency components of the personality is of significance in assessing the success of this form of treatment. Where hostility is swamped by dependency, only poor results can be expected. Such patients are too insecure to be able to risk rejection by exposing their hostility, and attaining relief by this means.

My thanks are due to Dr. J. S. Harris, Dr. P. H. Tooley and Dr. Henry Wilson for permission to publish this paper and for the help and encouragement they have given me. I owe thanks also to Dr. D. V. Martin and Dr. J. B. Lindsay for their suggestions and criticisms of this paper.

BIBLIOGRAPHY.

(1) CAMERON, D. EWEN, " The Conversion of Passivity to Normal Emotional Feelings," *Am. J. Psych.*, June, 1951.
(2) SARGANT, W., " The Mechanism of Conversion," *B.M.J.*, 11 Aug., 1951.
(3) KOREN, L., GOERTZEL, V., and EVANS, M., " Psychodynamics of Failure in Therapy," *Am. J. Psych.*, July, 1951.
(4) EDKINS, J. R. P., " Further Developments in Abreaction," *Modern Trends in Psychological Medicine*. Butterworth, 1948.
(5) SUTTIE, *The Origins of Love and Hate.*

STUDIES ON THE PHYSIOLOGY OF AWARENESS: THE EFFECT OF RHYTHMIC SENSORY BOMBARDMENT ON EMOTIONS, BLOOD OXYGEN SATURATION AND THE LEVELS OF CONSCIOUSNESS.*

By John W. Lovett Doust, B.Sc., M.B., B.S.Lond., M.R.C.P.,
and
Robert A. Schneider, B.A., B.S., M.D.Minnesota,
with the technical assistance of George W. Harris.

From the Psychophysical Laboratory, Department of Psychiatry,
University of London Institute of Psychiatry, Maudsley Hospital, London.

Biological rhythms exist in a rich variety and almost bewildering profusion to attend and equilibrate the physiology of man. Such dynamic phasic activity appears not only to be intimately concerned with the phenomenology of life and biological processes in general, but is also to be found in purely chemical systems (Hedges and Meyers, 1926). Modalities of the periodicities associated with life can be divided into those external to the organism—including diurnal and climatic variation, sun-spot activity, etc., and into those inherent within the individual such as the respiratory and cardiac rhythms, the menstrual cycle, sleep and awakening. Only less well marked are certain psychological periodicities such as "cyclothymic" variations in mood and personality. In the course of the present century much painstaking research has attempted to link external with internal rhythmic activities, significant correlations being adduced between seasonal variation and, for example, the incidence of psychiatric disorder (Huntington, 1915), immunity from disease (Spencer and Melroy, 1943; Webster, 1944), temperament and behaviour (Petersen, 1934–36; Mills, 1942), and an impressive array of biochemical and physiological variables ranging from blood pH, lactic acid and protein to breath-holding time, plethysmography, tests of hand strength and fatigability, dark adaptation time and various tests of urinary function (Petersen, 1947).

Neurophysiologically (Richter, 1950), there is evidence both for chemical (Brazier and Finesinger, 1945) as well as for electrical (Walter, 1950*a*) patterns of periodic activity in the nervous system. Repetitive discharges with frequencies of 5–10 c./sec. from isolated stellate ganglion preparations were found to be capable of change by variation in the ionic concentrations of the surrounding medium (Bronk, 1949), and Kaufman and Hoagland (1946) have findings suggesting a chemical pacemaker closely identified with cerebral respiration. The function of the diencephalon as a neural pacemaker has long been postulated (Cobb, 1946, p. 95), and it appears certain that the hypothalamic aggregation of nuclei with its neural and endocrine connections must play an outstanding role in emotional and awareness variation.

Cross-sectional studies involving spectroscopic and photo-electric oximetric measurements in healthy and psychiatrically disturbed subjects (Lovett Doust, 1951*a*, 1952) have suggested a close linkage between arterial oxygen saturation levels and awareness thresholds. Longitudinal studies in similar populations have also yielded significant correlations along the same axes, the correspondence, for example, between the progressive stages of deepening natural sleep (Lovett Doust and Schneider, 1952) and increase in oximetrically determined anoxaemia being very close.

The present investigation arose from an interest in the possible oximetric correlates of inherent biological rhythms, the relationship of these to the levels of consciousness, and the capacity of such variables to change under experimentally controlled intermittent visual, auditory, and tactile patterns of sensory stimulation.

---

* Substance of a paper presented at the February, 1952, open Meeting at the Maudsley Hospital, London, of the Pathology Subcommittee, Research and Clinical Section, Royal Medico-Psychological Association.

EXPERIMENTAL PROCEDURE.

Spectroscopic Oximetry.

Oximetric determinations were carried out by a discontinuous, peripheral technique employing a pocket spectroscope (Ray, 1946), the finger-nail fold (Lovett Doust, 1952) being the site of examination. Repeat readings were always taken, these being often checked by one or more other examiners. Considerable experience with this method has given the present writers the ability to arrive at readings which agree to within 1 to 2 seconds' reduction time on any individual in any given experimental situation. Histaminization of the finger-nail fold was an invariable prelude to the investigation, thus insuring maximal vasodilatation of the part, and factors of local heating and illumination, etc., were always held constant. The reliability and validity of this method of estimating arterial blood oxygen saturation has already been referred to elsewhere (Lovett Doust, 1951*b*).

Production of Intermittent Photic, Sonic and Tactile Stimulation.

The modalities of rhythmic sensory bombardment were covered by a variety of methods producing stimulation. In the early stages of the work three electronic stroboscopes were used for intermittent photic bombardment. One of these instruments was the relatively low intensity Dawe "Stroboflash"; the others were ordinary commercial models by Scophony and E.M.I. respectively. Experience with the latter two high intensity thyratron machines made us realize that intermittent sound effects were produced simultaneously with the light flashes in these stroboscopes. It became necessary, therefore, in order to separate photic from sonic bombardment, to devise an instrument which would influence only one modality of sensation at a time. To this end a simple condenser discharge circuit operating a neon tube to run a high speed relay system was constructed in the Institute workshops. Contactors from this machine triggered a battery of six 75-watt incandescent lamps connected in parallel while, for sonic stimulation, a 6-in. loud speaker was incorporated in the circuit and run off a second high speed relay system. Fig. 1 gives the circuit diagram of this instrument, and a control panel enables the equipment to be used to produce either sonic or photic rhythmic stimulation with a roughly square wave output or these two patterns of stimulation simultaneously. A volume control was incorporated to enable the speaker output to be varied from a power of 1 up to 5 watts, while successive removal of the incandescent lamps or placing a silvered mirror behind the battery enabled the wattage output here to be varied from 75 to 900. Arrangements were also made for the equipment to trigger off a tactile stimulator to be described *infra*. In practice it proved impossible to dissociate the sonic factor from the photic stimulation owing to the additional noise inherent in the relay systems used; this difficulty was overcome by siting the sonic contactor unit in a room adjacent to that in which the subject was receiving pure photic stimulation.

Intermittent tactile stimulation was obtained by an electromagnet synchronized from the main stimulator unit and supported vertically over a steel rod, the upper end of which was suspended on a rubber diaphragm. The free end of the rod made intermittent contact with the ventral surface of the finger placed beneath it.

Calibration of the main stimulator unit was accomplished by cathode ray oscilloscope control. The technical limitations of this instrument allowed for a sonic intermittency of 2 to 70 f./sec., but the range for photic stimulation was less, from 2 to 18 f./sec., and for tactile stimulation only from 2 to 11 f./sec. Photic stimulation at frequency ranges above 18 f./sec. was available through the use of the electronic stroboscopes.

Clinical Material.

A total of 109 subjects was investigated. Of these, 58 (51 males, 7 females) were healthy controls with an age range of 18 to 36 years. They comprised a majority of serving soldiers, detailed to attend from a neighbouring Army Depot; the remainder included hospital research workers, technical and clerical staff. The remaining 51 subjects were all hospital patients (28 males, 23 females); their ages ranged between 19 and 90 years. Diagnostic categories represented included 10 patients with psychopathic personality or psychoneurosis, 20 patients with schizophrenia and 11 with idiopathic epilepsy. All the foregoing patients came from the wards of the Maudsley Hospital; a further group of 10 old people (age range from 65–90 years) was investigated at Tooting Bec Hospital by the courtesy of Dr. J. E. S. Lloyd, Medical Superintendent of that hospital.

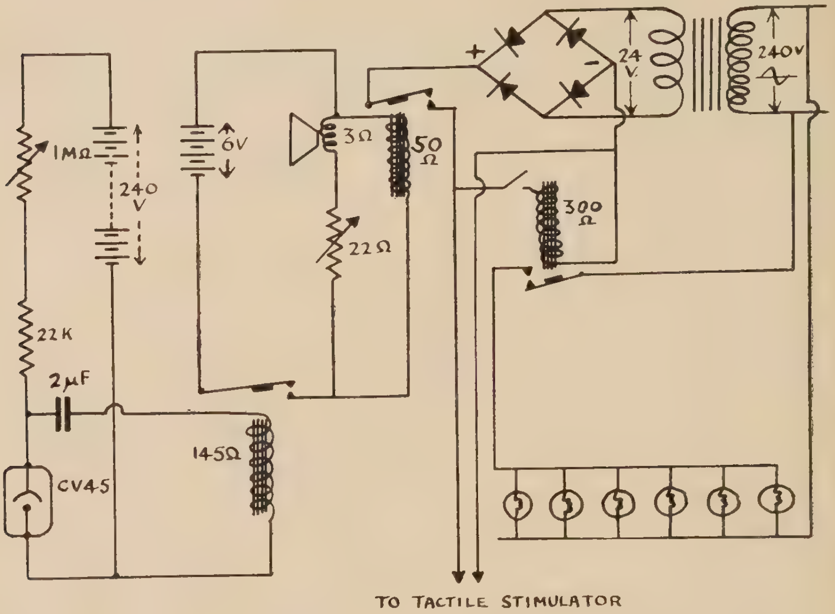


FIG. 1.—Circuit diagram showing the condenser discharge method of obtaining regularly intermittent stimulation. The circuit includes a power pack rectifying the stepped-down mains voltage of 24 volts. This operates the two high-speed relay systems needed for the additional alternative patterns of stimulation. The paper condenser discharges through a neon tube and is energized from two 120-volt radio batteries connected in series. The loud speaker used for sonic stimulation has a cone 6 in. in diameter. Switches enable sonic, photic and tactile stimulation to be administered separately or simultaneously in any combination.

RESULTS.

Oximetric Monitoring at Varying Stimulation Frequencies: Healthy Group.

Fig. 2 shows the effects on arterial oxygen saturation levels when intermittent rhythmic photic stimulation is used to bombard a healthy subject whose resting oxygen saturation lay at 96·9 per cent. (R.T. = 41 secs.). It will be seen that marked changes from the resting oximetric level take place when the frequency of such stimulation is changed. Progressive anoxaemia occurs with increase in stimulation frequency reaching a maximum around 5 f./sec. This is then recovered from, resting levels being attained at a stimulation rate of 10 f./sec. Continued increase in frequency then produces a harmonic of the initial anoxaemia maximal at 15 f./sec., resting levels again being attained at a stimulation rate of 20 f./sec. Following these twin periods of anoxaemia, further increase in the photic stimulation frequency produces an increase of the oximetric values which reach a maximum at 25 f./sec. This oximetric elevation is, however, not sustained with increasing rates of stimulation, and falls to levels corresponding to those seen at 0, 10 and 20 f./sec. when the light was flashing at 32 f./sec. Further increase in stimulation frequency beyond 32 f./sec. produced no further change in the oximetric levels. These findings exemplified in Fig. 2 are echoed in Fig. 3, in which the scatter of the results in 28 healthy subjects is given. The same phases of anoxaemia, return to resting levels and after rise are seen, with a final return to resting values around stimulation rates of 30 f./sec. It will be noted however that, in this graph of massed subjects, the first return phase to resting levels occurs mainly

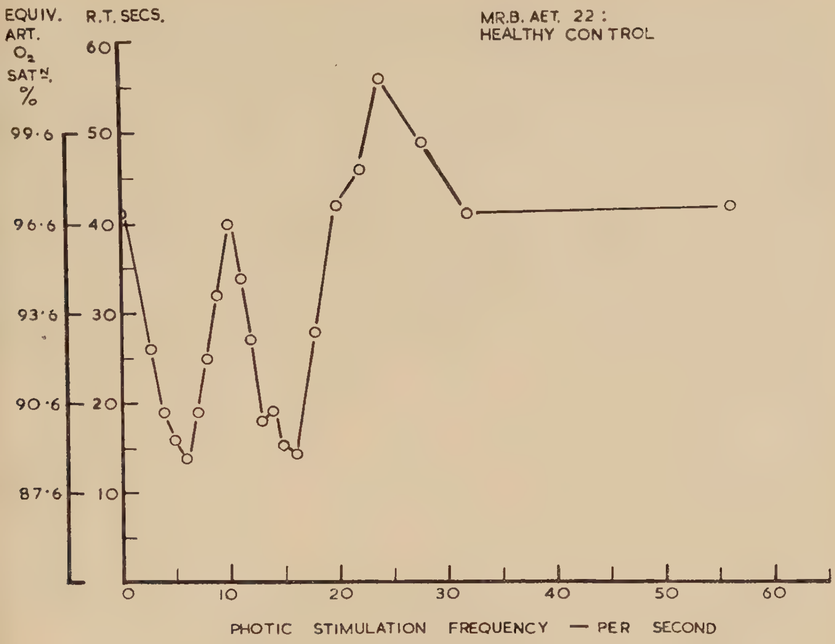


FIG. 2.—Effect of rhythmic photic stimulation at frequencies ranging from 3 to 56 f./sec. on oximetrically monitored (R.T. secs.) arterial oxygen saturation levels in a healthy subject. An additional ordinate indicates the equivalent percentage saturation values as ascertained by the use of a regression equation.

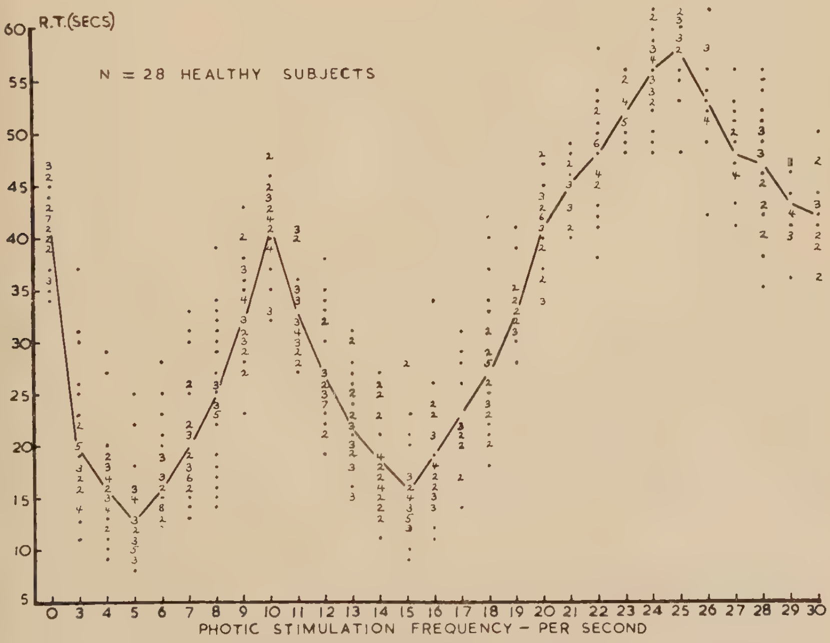


FIG. 3.—Scatter and means of massed oximetric readings at given stimulation frequencies in 28 subjects.

between stimulation rates of 9 to 11 f./sec., the second between 18 to 22 f./sec., the phases of anoxaemia and hyperoxaemia showing a similar scatter about the means.

Consideration of Fig. 4 indicates that an identical oximetric pattern may be obtained when intermittent rhythmic sonic bombardment is substituted for photic stimulation. Using a similar range of stimulation frequencies, not only do the same phases of anoxaemia, hyperoxaemia and returns to resting levels take place, they also occur at the same frequencies as have been noted with photic bombardment. These results have been confirmed in a further 22 healthy subjects where sonic stimulation was used alone. Of the healthy subjects receiving sonic bombardment, approximately half were stimulated using a speaker output of 1 watt. In the remainder the effect of various changes in output intensity were investigated. It was found that, while the changes were small, increases in intensity of sonic stimulation tended to increase the degree of anoxaemia produced. Fig. 5 records an example of a subject receiving sonic stimulation at different intensities, oximetric readings being taken at each stimulation frequency both when sonic intensity was low and when it was increased by 7 decibels. Summation of sonic and photic stimulation (Fig. 6) showed a similar summation of oximetric measurements. Comparison with the normal sonic profile showed significant increases at both anoxaemic phases but did not affect the return to resting level values.

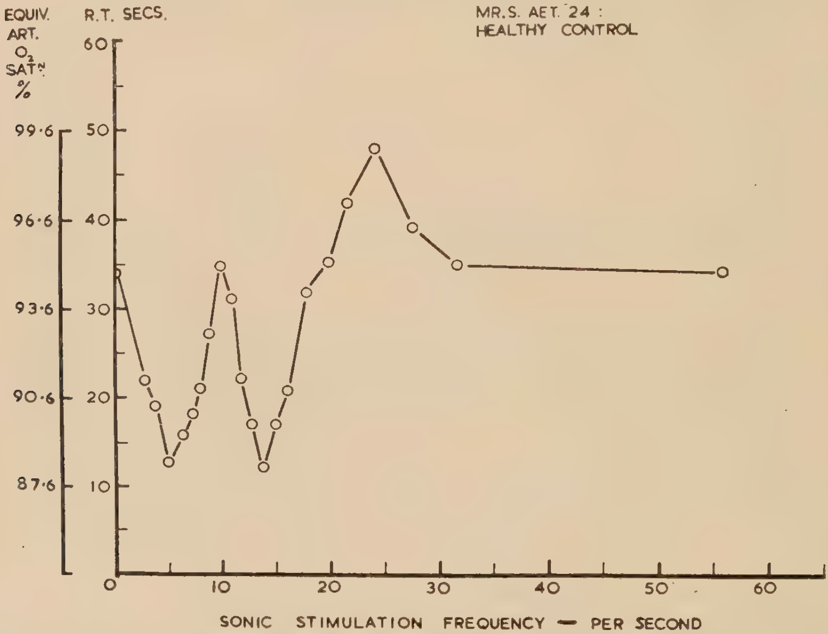


FIG. 4.—Effect of rhythmic sonic stimulation in a healthy subject. Compare this profile with Fig. 2.

The technical limitations of the tactile stimulator precluded a comparable demonstration of its oximetric effects at all stimulation frequencies. It was, however, possible to demonstrate that, for frequencies within the range of 2 to 11 f./sec., a pattern identical with the oximetric responses to photic and sonic stimulation could be obtained. Fig. 7 indicates that a decline in arterial oxygen saturation levels of some 9 per cent. occurred with intermittent tactile stimulation at 5 f./sec. The pattern of the profile suggests that if the stimulation frequency had been increased beyond 11 f./sec. similar results to those obtained by the stimulation of other sensory modalities would have occurred.

Comment.—Walter (1950*a*) has reviewed the evidence that photic stimulation at certain critical frequencies evokes the same slow delta activity in the E.E.G. as does anoxic anoxia. Gastaut and Corriol (1948) have shown that the simultaneous application of rhythmic visual and auditory stimuli produce mutual summation

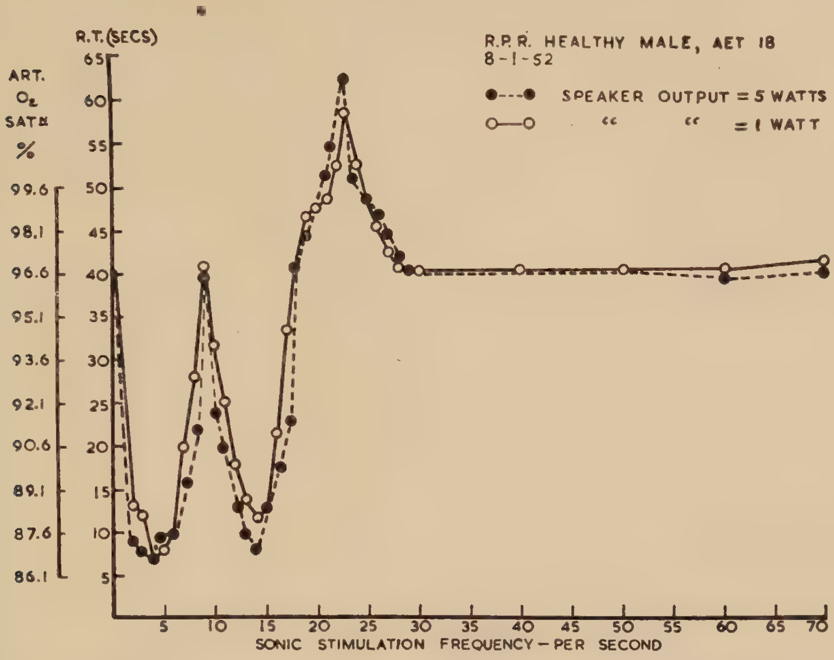


FIG. 5.—Effect of a change of 7 decibels in oximetric readings at different frequencies of sonic stimulation.

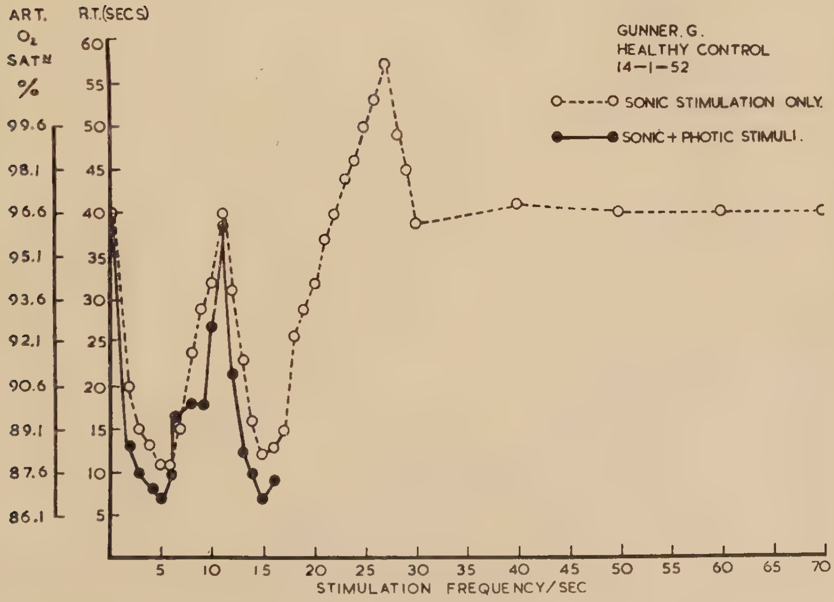


FIG. 6.—Effect of summation of sonic and photic stimulation.

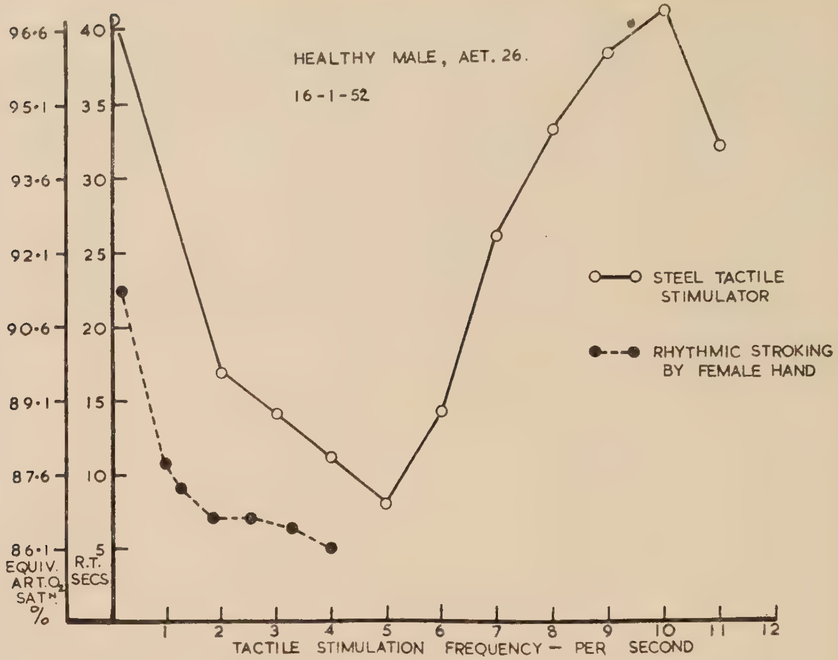


FIG. 7.—Within a frequency range of 2 to 11 f./sec. the same oximetric profile is obtained with tactile stimulation as with sonic and photic bombardment. It is interesting to note that when the same area of the skin is stimulated by a hand stroking it at similar frequencies, the same profile pattern is obtained but the intensity of the anoxaemia is greatly exaggerated.

and facilitation of evoked E.E.G. rhythms. Hyde and Gellhorn (1951) studied the electromyographic tracings from skeletal muscles when the motor cortex was stimulated by condenser discharges of 10–102 f./sec. They found differential responses to different stimulation frequencies, but did not note any change in the response pattern to variations in the intensity of stimulation.

Oximetric Monitoring at Varying Stimulation Frequencies: Psychiatrically Abnormal Group.

The regularity of the oximetric profiles seen in the healthy group was often strikingly different from those seen in the psychiatric populations studied. The variations found were principally of two main orders, those in which a shift to the left or to the right in the oximetric profile was seen, and those in which the regularity of the profile was replaced by a chaotic absence of pattern. An example of the first is given in Fig. 8, a case of paranoid schizophrenia. Here the maximum anoxaemia did not occur at photic stimulation frequencies of 5 and 15 f./sec., but these were displaced to 4 and 10 f./sec., the returns to oximetric levels equivalent to resting values being at 7, 14, and 22 f./sec. respectively. It is interesting to note that the dominant E.E.G. rhythm in this patient was in the theta rather than in the alpha range and was about 7 c./sec. A rather different phasing was noted in certain patients with idiopathic epilepsy. Fig. 9 emphasizes the enormous lability of these patients to rhythmic sensory bombardment. The oximetric levels at rest are typically very high in this disorder (Lovett Doust, 1952), and ran in this patient at R.T. = 57 seconds. Sonic stimulation at 4 to 8 f./sec. produced a fall to R.T. = 7 to 8 seconds. Recovery to resting levels occurred at a stimulation frequency of 27 f./sec. and again at 50 f./sec. An example of chaotic loss of regular patterning was seen typically in the group of schizophrenic patients with catatonic stupor. Fig. 10 lists the profile data of a patient in such a state, and indicates both the lack of oximetric lability to photic stimulation and the choppy nature of the oximetric profile within the frequencies of 6 to 36 f./sec.

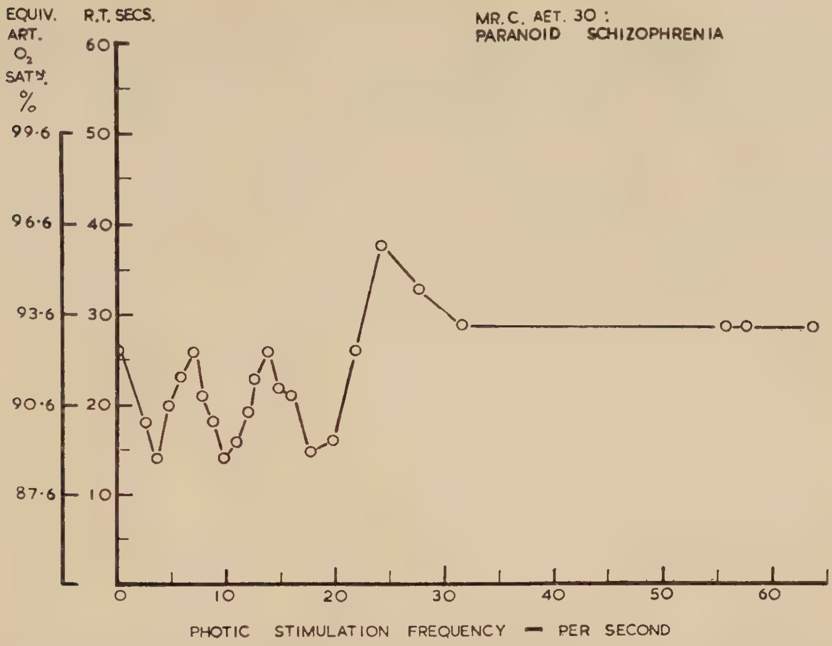


FIG. 8.—Effect of photic stimulation through a frequency range of 3 to 64 f./sec. in a patient with paranoid schizophrenia. Compare with Figs. 2 and 4.

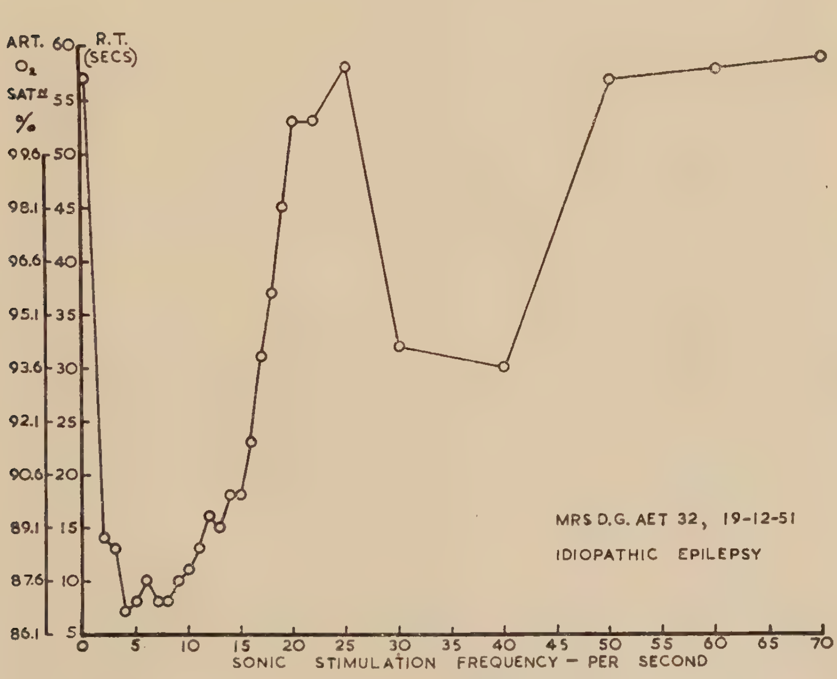


FIG. 9.—Effect of sonic stimulation in a patient with idiopathic epilepsy. By contrast with Fig. 8 in which a shift to the left from the normal profile has occurred, this patient shows a typical shift to the right.

In contrast to the profiles obtained when rhythmic sensory bombardment was employed, Fig. 11 shows the variations in oximetric monitoring when a patient with *petit mal* epilepsy is examined on an axis of time. R. B—, a boy of 8 years of age suffering from *petit mal*, was known to have bursts of epileptogenic discharges every few minutes. His oximetric status was determined at approximately one-minute intervals over a period of about three-quarters of an hour. The Figure shows a series of oximetric " spikes," of which four stand out clearly on the chart. Clinically it was noted that immediately following these high R.T. values some objective change was obvious in the patient. Sometimes this took the form of a transient pallor of the face, at others twitching of one arm and hand or temporary loss of consciousness without falling.

A total of 11 idiopathic epileptics was examined. Oximetric findings with rhythmic sensory bombardment suggested that half these patients had profiles resembling that of Fig. 10; the remainder showed the shift to the left exemplified in Fig. 8, with less well-marked lability of response.

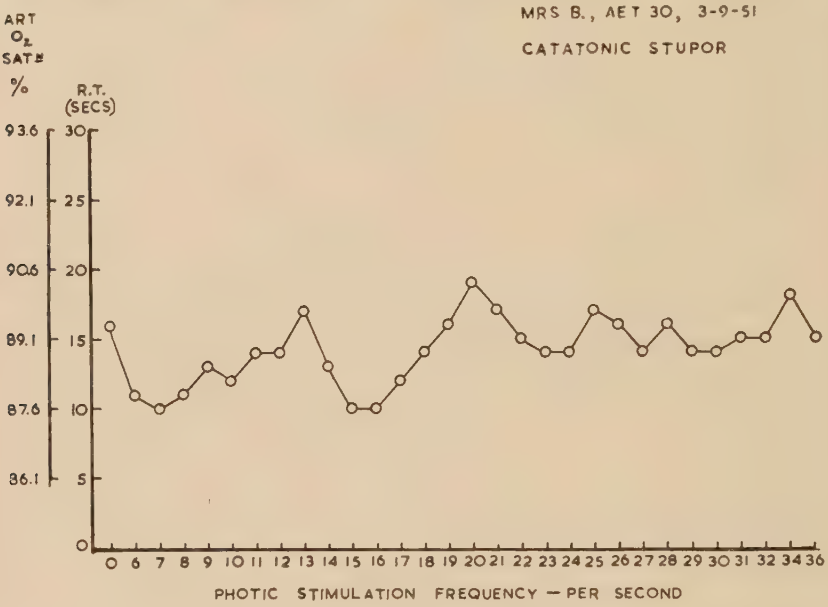


FIG. 10.—Effect of photic stimulation in a schizophrenic patient in catatonic stupor. Note absence of any dominant pattern.

The patients with senile dementia formed a compact group. With increasing deterioration it was found that oximetric lability to intermittent sonic stimulation became less obvious until, with profound dementia, a flat profile was obtained.

Most psychoneurotic and psychopathic patients showed oximetric profiles to stimulation in accord with those of the healthy group. Some of these patients, and especially those with psychopathic personality, however, showed the shift to the left as seen in Fig. 8.

Comment.—Sonic stimulation has been rather widely employed as a method of changing behaviour patterns in both man and animals. The experiments of Meier and his collaborators in America have become almost classical in this latter regard. The production and evaluation of " experimental neurosis " and audiogenic seizures in rats (Morgan and Gould, 1941) are not only dependent upon differential sonic stimulation, but the quality of change has been found to vary with the intensity and frequency of the sound employed. In man the association of simple (Gowers, 1881) and flickering (Cobb, 1947) photic stimulation and seizures in certain patients prone to convulsions has been confirmed (Gastaut *et al.*, 1948; Walter and Walter, 1949). Audiogenic stimuli have been rather less widely investigated in man, but their relationship with epilepsy was first noted by Merzjejevskif in 1884 (Critchley, 1937). Sporadic reports since then (e.g., Shaw and Hill, 1937) have, however, confirmed the relationship. In disorders other than epilepsy there is growing evidence electrophysiologically that the E.E.G. correlates of anoxaemia frequently are found in such psychiatric disorders as schizophrenia (Davis, 1942), psychopathy (Hill, 1944) and violent criminality (Hodge, 1945).

Conscious Psychophysical Concomitants of Rhythmic Sensory Bombardment.

Thirty-eight of the healthy subjects investigated were asked at the termination of 30-minute periods of either intermittent sonic or photic stimulation whether they had noticed any subjective effects. Two such 30-minute periods of rhythmic sensory bombardment were given to each subject, one at that critical frequency producing the maximal oximetric rise, and the other at the frequency giving the maximal depression in oxygen levels—i.e., at stimulation frequencies of *circa* 25 and 5 or 15 f./sec. respectively. The comments were spontaneous ones. They were collected under various headings and are given in Table A. It will be noted

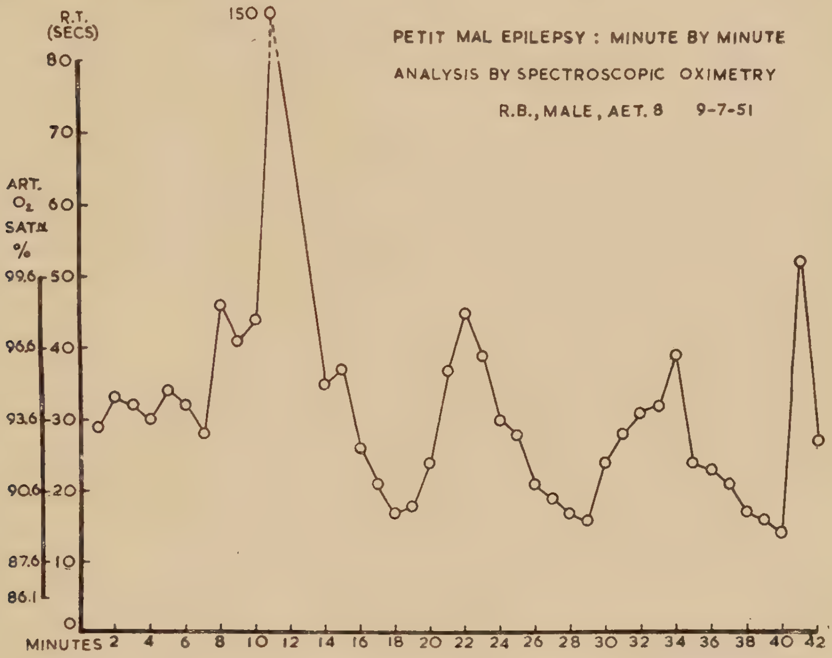


FIG. 11.—Oximetric monitoring over a period of 42 minutes in a patient with *petit mal* epilepsy. No external stimulation was applied, the oximetric variation apparently representing spontaneous phasic epileptogenic activity.

TABLE A.—*Summary of Spontaneous Comments offered by* 38 *Healthy Subjects given Intermittent Sonic or Photic Stimulation for* 30-*minute periods while their Attention was Sustained by Routine Tasks.*

Comments.	Stimulation rate.	
	25 f./sec.	5 or 15 f./sec.
No effect noted	22	8
Feel better, pleasant	7	0
Concentration improved, mind " sharper " .	3	0
Concentration poor, feel slowed up . .	0	9
Tired, drowsy, sleepy	0	8
Irritable annoyance ; " fed up " . .	1	13
Desire to stop machine or break it . .	0	10
Headache, dizziness, giddiness . . .	1	9

that, in general, deleterious effects both psychological and kinesthetic were complained of at stimulation frequencies giving low oximetric values whereas converse effects were described when the oximetric levels were elevated. The tendency of complaints at low oxygen levels was to relate introspected phenomena either to a threshold of lowered awareness, the subject noticing impaired attention, concentration and mentation with all-enveloping feelings of fatigue and drowsiness, or to emotionality, when he would find himself irritable, aggressive and with an urge to stop the bombardment by physical violence. Typical comments at low oxygen levels included such statements as " I felt it was a nuisance. It made me irritable. I could have knocked the machine across the room." "I could hardly sit still. It was uncomfortable, annoying and irritating." " I got worried and upset. I couldn't think things out so well. Thinking was harder and slower." And conversely, " The light bothered me. I couldn't concentrate, I got tired and sleepy." " It made me feel drowsy and gave me a headache over my left eye." Of those stimulation frequencies elevating the oximetric levels, however, the effect on the subject was exemplified by such comments as " It sharpened my mind." " I felt pepped up and more alert. It was much more pleasant and I could think more clearly."

Comment.—The inter-relationships between intermittent retinal stimulation, consciousness and emotions have been the subject of numerous neurophysiological and psychological inquiries (Walter, 1950*b*). Attention and vigilance have been found to vary with the rate of intermittent stimulation and to be accompanied by beta rhythms in the E.E.G., while slow photic stimulation frequencies tend to produce diverse emotional and somato-aesthetic accompaniments (Walter, 1950*a*). Such findings in healthy subjects are more readily and more intensely seen, however, in patients with psychiatric disorders.

Evocation of Unconscious Conflict Material by Rhythmic Sensory Bombardment.

While the profile records were being taken it was not uncommon to observe, even with short periods of stimulation at each frequency, the eruption into consciousness of hitherto unconscious psychopathology. This occurred more commonly among the psychiatric patients than with the healthy subjects. It included examples of several different orders of phenomena. One type of occurrence would be seen during the varying sonic or photic sensory bombardment of a schizophrenic patient. The patient might come to the laboratory without much external evidence of his mental disorder. Stimulation at frequencies found to depress his arterial oxygen levels would then be accompanied by audible responses to apparently hallucinated remarks, muttering, suspicious glances over one shoulder or evidence of overt somatic anxiety. When the stimulation frequencies were progressively increased and concurrently his oxygen levels rose to values not significantly different from his resting values, these phenomena would tend to disappear and the patient would once more assume a quiet and co-operative demeanour. It was perfectly possible both to produce these altered states at will by stimulating at the appropriate frequency and also to cause them to disappear. An example of this happening was seen in a male patient aged 32 with hebephrenia. The patient's oximetric profile was not abnormal, returns to unstimulated oximetric levels occurring at stimulation frequencies of 10 and 20 f./sec. Stimulation at either of these two latter frequencies induced blood oxygen saturation levels of 92 per cent., during which time the patient was outwardly calm, co-operative and silent. Stimulation at rates of either 5 or 15 f./sec. (o_2 sat ^{n}. =88–91 per cent.) produced a remarkable change in the clinical status. He began hallucinating, muttered darkly of " thunder and lightning. Four hundred million trillion volts. You're playing with 400 million volts. Four hundred million reserves and all those million acid cells. It could blow you up one of these days doing that." He went on to speak of alleged troubles concerning his heart and his words included neologisms. " It's the springs and the insulation. My heart is 'sievering.' The top and the bottom are not joined up. Angels are dancing on my palm." From the moment that the oxygen levels were caused to rise above 92 per cent. by increasing the stimulation frequency to 20 f./sec. and beyond, neologisms, hallucinations and the delusional system disappeared to clinical observation.

Other types of occurrence were seen during the routine profile determinations on a variety of different psychiatric disorders. Neurotic patients would tend to become frightened, with sweating, cringing and pallor among other objective clinical evidence of change, such happenings taking place at critical stimulation frequencies in accordance with the individual pattern of their oximetric profile, while catatonically stuporous or excited patients would show quite marked objective changes in their awareness thresholds at frequencies critical for them.

A particularly interesting example of the changes in levels of consciousness and emotional status was seen during the examination of an unusual patient whose precise clinical psychiatric diagnosis is still in some doubt. This patient, a man of 42 years, came to hospital complaining of certain rather frightening experiences which had been taking place with increasing severity during the past few years. The patient had spent much of his life in India and, on his return to England, had increasingly become aware during the small hours of the night of a nightmare from which he could not awake or escape. He felt, at about two o'clock in the morning, what he described as " a call from the jungle." The call was irresistable. Despite his efforts to ignore it and awaken, he felt himself drawn away from the real world to enter into the life of an ape. His recollections for the ensuing two hours each night do not go beyond this state of mind, but objectively his clinicians report that he lives the life of an ape-man before the dawn breaks and he awakens. During this time he becomes violent and aggressive, attacks those who attempt to restrain him, growls unintelligibly and even climbs trees with remarkable agility for a man of his age and proportions.

A routine oximetric profile determination was taken, photic plus sonic bombardment being employed, the frequency at each stimulation rate being maintained for approximately 5-minute periods. The profile showed lability, and there was a shift to the right from normality. Equivalence with resting oxygen levels was attained at 13 and 26 f./sec., and there was an absence of the " after rise " seen in healthy subjects. Blood oxygen saturation was found to be maximally depressed to 86·4 per cent. at stimulation frequencies around 17 to 19 f./sec. The attitude of the patient showed marked variation, depending upon the frequency of the stimulation employed. Values which did not affect the oxygen levels were associated with such spontaneous comment as "Its all right " and "I feel all right." Frequencies which caused a decline in the oximetric levels were associated with irritable paranoid ideation, colour patterning, illusions of monkeys or gorillas and movement, suspiciousness and marked anxiety. Typical comments at 17 f./sec. stimulation : " There's a mass of colour and a gorilla in the centre." " I am looking straight at the gorilla now. I can see the shadowy form. He is dark, hairy, fierce and frightening. He's too big. The gorilla is getting closer. He is the centre of a mass of colour."

Comment.—A variety of therapeutic and investigatory techniques have been employed in psychiatry as aids in bringing into increased levels of consciousness repressed, unconscious, conflict-laden material. These techniques include the exhibition of numerous pharmacological and metabolic agents ranging from sodium pentothal and ether to mixtures of carbon dioxide and oxygen, " continuous " sleep procedures, hypnosis, and various forms of psychotherapy. Associated with the increased degree of awareness of hitherto unconscious psychopathology, there often occurs partial or complete recovery from the psychiatric disability. Indeed, evaluation of the success or otherwise of a new therapeutic procedure in psychiatry will often be made on its relative efficacy in attaining just these ends. The analogy between the levels of awareness present in dreams attending natural sleep, the " world of wakened dreams " that is the life of the schizophrenic, and the relaxed uninhibited, encouraged flow of talk from the analysand on his psychoanalytic couch with those evoked at will during rhythmic sensory bombardment is striking. The correlation between the significant oximetric changes at these times, in a cross-sectional survey of a schizophrenic population (Lovett Doust, 1952), in sleep (Lovett Doust and Schneider, 1952) and the phenomenology of anoxic anoxia appears worthy of further scrutiny in psychiatric practice.

DISCUSSION.

Physiologically, McDowall (1950) has defined consciousness (p. 620) as " an awareness of the existence of oneself and of the external world," and he emphasizes that the evidence is very complete that in man it is dependent upon the amount of oxidation taking place in the cerebrum. Psychologically, despite the many meanings attached to the term (Miller, 1942), the problems of consciousness appear intimately bound with those of emotion, MacCurdy (1925, p. 567) writing of affect that it is the "impression made on consciousness by unconscious imaginal processes which do not gain any other outlet." Factors therefore which determine awareness thresholds will also affect emotional status, and *vice versa.*

There is abundant evidence in nature of the capacity for intermittent rhythmic sensory bombardment to change both the rate and the pattern of physiological responses in the organism. This is seen in plant life as well as in the animal kingdom, and Rabinowitch (1945) has reviewed the effects of changing flicker frequencies on the oxygen yield in photosynthesis. In mammals the rhythmic trains of impulses from the respiratory centres can be inhibited, or their patterns changed by voluntary effort or involuntarily by emotion or artificial respiration procedures, with concomitant changes in the field of awareness and sometimes profound alterations in the oxygen metabolism of the subject.

In a recent review of the electrical phenomena associated with consciousness and emotional activity, Grey Walter (1950*a*) notes (p. 79) the drowsiness and lethargy resulting from the passage of very low frequency electric currents through the brain, and mentions (p. 81) that, with photic stimulation at 6–7 c./sec., some healthy subjects respond with theta (4–7 c./sec.) activity in their E.E.G. Such activity is not uncommonly accompanied by emotional and kinesthetic concomitants, and it is relevant to add that rhythms of similar frequency often precede the acute changes in awareness accompanying epileptic fits. Finally Walter mentions (p. 84) that, in certain normal subjects, photic stimulation at 14–25 c./sec. tends to evoke a transient fronto-temporo-parietal discharge which is "accompanied by disagreeable sensations which, if persistent, would be regarded as psychotic."

The intimate relationship between emotions, awareness, anoxaemia and E.E.G. activity is well seen in the interdependence of all these variables, since to change one is to produce change in all the others. Anoxic anoxia is known to evoke diffuse symmetrical 5–7 c./sec. E.E.G. activity and emotional and consciousness changes varying in accordance with the intensity of the anoxaemia. Our present findings indicate that deliberate induction of anoxaemia by critical choice of suitable stimulation frequencies in any convenient modality of sensation evokes differential changes both in affect and awareness.

SUMMARY.

1. Experimental techniques designed to produce regularly intermittent visual, auditory and tactile stimulation in human subjects are described. Blood-oxygen saturation levels were monitored by a method of spectroscopic oximetry during the periods of stimulation.

2. Profiles were obtained on 58 healthy subjects and 51 patients suffering from a variety of psychiatric disorders. Oximetric measurements were taken at stimulation frequencies varying from 2–70 f./sec., and it is shown that the oxygen levels varied critically with the stimulation rates, intensity of stimulation and summation of different modes of stimulation. Oximetric levels showed however the same patterns of change irrespective of whether the type of stimulation was separately photic, sonic or tactile.

3. Similar, but not identical stimulation profiles were obtained from the patients but many showed differential lability of response or a shift to the left from the healthy pattern.

4. In most subjects it was possible to obtain significant degrees of oximetric anoxaemia, hyperoxaemia or equivalence with resting levels dependent upon the critical stimulation frequency employed.

5. By depressing the oxygen levels by the choice of optimal stimulation frequencies, spontaneous comments by the healthy subjects revealed considerable changes in affect and levels of awareness while, among the patients, repressed unconscious material was brought into consciousness.

6. The implications of these findings are discussed.

BIBLIOGRAPHY.

BRAZIER, M., and FINESINGER, J. E., *Arch. Neurol. Psychiat.*, 1945, **53**, 51.
BRONK, D. W., *Croonian Lectures*, 1949, Royal Society, London.
COBB, S., *Borderlands of Psychiatry*, 1946. Cambridge, Mass.: Harvard Univ. Press.

Idem, Arch. Neurol. Psychiat., 1947, **58**, 70.
CRITCHLEY, M., *Brain*, 1937, **60**, 13.
DAVIS, P. A., *Am. J. Psychiat.*, 1942, **99**, 210.
GASTAUT, H., ROGER, J., and GASTAUT, Y., *Rev. Neurol.*, 1948, **80**, 161.
Idem, and CORRIOL, J., *Comptes Rend. Soc. Biol.*, 1948, **142**, 349.
GOWERS, W. R., *Epilepsy and Other Chronic Convulsive Diseases*, 1881. New York.
HEDGES, E. S., and MEYERS, A., *The Problem of Physico-Chemical Periodicity*, 1926. London: E. Arnold & Co.
HILL, D., *Proc. Roy. Soc. Med.*, 1944, **37**, 317.
HODGE, R. S., *J. Ment. Sci.*, 1945, **91**, 472.
HUNTINGTON, E., *Civilization and Climate*, 1915. New Haven: Yale University Press.
HYDE, J., and GELLHORN, E., *Brain*, 1951, **74**, 432.
KAUFMAN, I. C., and HOAGLAND, H., *Arch. Neurol. Psychiat.*, 1946, **56**, 207.
LOVETT DOUST, J. W., *Proc. Roy. Soc. Med.*, 1951*a*, **44**, 347.
Idem, Ann. Rheumat. Dis., 1951*b*, **10**, 269.
Idem, J. Ment. Sci., 1952, **98**, 143.
Idem, and SCHNEIDER, R. A., *Brit. Med. J.*, 1952, i, 449.
MACCURDY, J. T., *Psychology of Emotion: Morbid and Normal*, 1925. London: Harcourt Co.
MCDOWALL, R. J. S., *Handbook of Physiology and Biochemistry*, 1950. 40th ed. London: John Murray.
MILLER, J. G., *Unconsciousness*, 1942. New York: John Wiley & Sons.
MILLS, C. A., *Climate Makes the Man*, 1942. New York: Harper & Bros.
MORGAN, C. T., and GOULD, J., *Psychol. Rec.*, 1941, **4**, 258.
PETERSEN, W. F., *The Patient and the Weather*, 1934–36. Ann Arbor, Michigan: Edward Bros.
Idem, Man Weather Sun, 1947. Springfield, Illinois: Charles C. Thomas.
RABINOWITCH, E. I., *Photosynthesis and Related Processes*, 1945, vol. **1**. New York: Interscience Publishers, Inc.
RAY, G. B., *Amer. J. Physiol.*, 1946, **147**, 622.
RICHTER, D., in *Recent Progress in Psychiatry, Vol. II*, 1950, ed. G. W. T. H. Fleming, *J. Ment. Sci.*, p. 38, London.
SHAW, D., and HILL, D., *E.E.G. Clin. Neurophysiol.*, 1947, **10**, 107.
SPENCER, R. R., and MELROY, M. B., *J. Nat. Cancer Inst.*, 1943, **4**, 249.
WALTER, V. J., and WALTER, W. G., *E.E.G. Clin. Neurophysiol.*, 1949, **1**, 57.
WALTER, W. G., in *Recent Progress in Psychiatry, Vol. II*, 1950, ed. G. W. T. H. Fleming, *J. Ment. Sci.*, London, p. 76.
Idem, J. Ment. Sci., 1950*b*, **96**, 1.
WEBSTER, J. H. D., *Brit. Med. J.*, 1944, i, 22.

THE E.E.G.S OF THE RELATIVES OF SCHIZOPHRENICS.

By G. H. A. Chamberlain M.D., M.R.C.P.I., D.P.M.,
and
J. Gordon Russell, M.R.C.P.. D.P.M.,
St. Ebba's Hospital, Epsom, Surrey.

[Received 14 December, 1951.]

It has been shown by a number of workers that in a large proportion of cases the E.E.G.s of schizophrenic patients are abnormal. This paper is an attempt to increase our knowledge of the hereditary background of schizophrenia by recording the E.E.G.s not only of those suffering from the disease but also those of their near relatives.

When the E.E.G.s of patients suffering from psychiatric illness were first studied, it was considered that the patterns observed in the records of schizophrenic patients differed little in the main from those seen in the E.E.G.s of normal subjects. Before long, however, increasing experience revealed that many schizophrenics had abnormal E.E.G.s. P. Davis (1938, 1939, 1941) was able to classify the E.E.G.s of schizophrenics in accordance with her five-point scale, which ranged from complete normality to the most severe disorganization. In particular, she introduced the term " choppiness " to describe the low-voltage irregular fast rhythms (25–50 c/s) which were a characteristic feature of many of the E.E.G.s, and which, she believed, denoted organic changes. Of equal interest was the observation by Jasper (1939) that some of the records of schizophrenic patients resembled those observed in epilepsy. D. Hill (1947) has made a similar observation. In his paper on the relationship between schizophrenia and epilepsy he stated that 47 per cent. of a group of recent acute cases showed E.E.G. abnormality. He grouped the abnormal E.E.G.'s of his schizophrenic patients as follows :

I. Those showing mild, non-specific abnormality (non-paroxysmal, non-focal theta rhythm).
II. Those containing generalized non-paroxysmal dysrhythmia of fast and slow rhythms.
III. Those records in which grouped fast and slow activity of a *paroxysmal* type occur together with low-voltage spikes.

Hill found that with an older, more chronic group of patients the records were abnormal in 25 per cent. of cases—a considerable decline.

These figures should be considered in relation with the abnormality rate for the general population. This has been studied by several electroencephalographers. Lennox, Gibbs and Gibbs (1939, 1940) found that 6 per cent. of a control group of persons not related to epileptics had abnormal E.E.G.s. Williams (1942) found that 5 per cent. of R.A.F. flying personnel showed E.E.G. abnormality, compared with 10 per cent. among Army non-combatants. Hill and Watterson (1942) observed that 15 per cent. of a mixed group of nurses, psychiatrists and allied workers had abnormal records. In general, while the proportion of subjects with abnormal E.E.G.s varies with the group selected for study, it probably does not exceed 15 per cent. in the general population, and 10 per cent. probably is a fair approximation.

Material and Method.

This investigation was carried out at St. Ebba's Hospital, where the presence of a large juvenile psychotic unit provided a considerable proportion of young and acute cases, with a correspondingly young sample of relatives. Considerable difficulty was encountered in persuading relatives to come for examination—the causes of their reluctance were understandable. Nevertheless we were able to obtain the E.E.G.s of the near relatives of 45 schizophrenics, 30 male patients, and 15 female. The total number of siblings of these patients was 56 ; of these we obtained the records of 45. Of the 90 parents of the patients 27 were dead, or had deserted their families, or were ill or senile. Of 63 " possible " parents, we obtained E.E.G.s from 46.

In order to obtain controls we took records from 43 members of the Hospital staff—doctors, nurses, and medical auxiliaries. There were 23 males and 20 females in this group and all were under 45 years of age. The control group consisted of normal persons not closely related to schizophrenics, and of an age comparable to the patients and their siblings. It was not possible to obtain a sufficient number of older persons to act as controls for the parents.

Recording was carried out with a six-channel Ediswan electroencephalogram using conventional electrode placements. Wherever possible three minutes of over-breathing was recorded in all subjects under 60 years of age. The patients' E.E.G.s were recorded under fasting conditions, but it proved impossible to persuade the relatives to come fasting; nor, in view of this, did we ask the controls to do so. The relatives' E.E.G.s were usually shorter than were those of the patients.

The abnormalities in the patients' records were of a fairly marked character, and in cases of doubt it was often possible to repeat them, but with the relatives the abnormalities were usually less striking, and there were a number of doubtful and " anomalous " E.E.G.s. Two-thirds of the relatives had records that were undoubtedly normal. The remainder, which we considered to be doubtful or abnormal, were analysed, together with some controls, by Dr. M. Dawson of Belmont Hospital. Apart from the age of each subject, no further information was provided, and we are in complete agreement with her impartial assessment of the records.

General data concerning the relatives and controls are provided in the following three tables:

TABLE I.—*Distribution of Relatives and Controls.*

Mothers	28	Parents	46	Controls	Males	23
Fathers	18				Females	20
Brothers	21	Siblings	45			43
Sisters	24					
Aunts, etc.	4		4			
		Total	95			

TABLE II.—*Age Incidence.*

Age group.	Patients.	All relatives.	Siblings.	Controls.
Under 11 years	—	5	5	—
11–20 ,,	20	9	9	3
21–30 ,,	23	22	22	21
31–40 ,,	2	8	7	15
41–50 ,,	—	21	2	4
51–60 ,,	—	22	—	—
Over 60 ,,	—	7	—	—

TABLE III.—*Mean Ages.*

Controls.	Patients.	All relatives.	Siblings.	Parents.
27 yrs.	22 yrs.	39 yrs.	23½ yrs.	53 yrs.

RESULTS.

The general findings of this investigation are set out in the following table:

TABLE IV.—*Normal and Abnormal E.E.G. Distribution.*

E.E.G. type.	Patients.	Parents.	Siblings.	Other rels.	Controls.
Normal	25	43	31	4	38
Abnormal	20 (44%)	3 (6·5%)	14 (31%)	—	5 (11·6%)
Types of abnormality:					
Fast/Slow Dys.	5	—	1	—	—
Non-Specific	9	3	11	—	5
Paroxysmal	6	—	2	—	—

These figures show at a glance that a considerable proportion of the patients' E.E.G.s are abnormal, and that in this respect our findings are similar to those reported by other workers. A number of the relatives also had abnormal records, and here the proportion was highest among the siblings. Seventeen (18 per cent.) of the relatives' E E.G.s were abnormal, and when this figure was compared with those of the controls, no significant difference was observed. On the other hand, when the E.E.G.s of the controls were compared with those of the relatives of the same age-group, i.e., with those of the siblings, we find that the incidence of abnormality among the controls (5 out of 43) is significantly different from the incidence among the siblings (14 out of 45). With the χ^2 test, p is ·05. There was no significant difference between the patients and their siblings in the incidence of abnormality. It should be noted that in general the abnormalities encountered with the patients' E.E.G.s were much more marked than among those of the relatives. Among the parents, only 3 showed definite E.E.G. abnormality. This might have been anticipated, for constitutional abnormalities tend to die away after the age of 40 years. Still, it is perhaps worth noting that 9 of the records in this older age-group showed " anomalous " patterns, which in the present extent of our knowledge are noteworthy though not necessarily abnormal. The anomalies include instability of the dominant post-central rhythms of more than 1 cycle per second; and a general appearance of instability in the central and post-central areas. " Choppiness," or the presence of low-voltage irregular fast activity at 25–50 c/s, was witnessed in 7 of the patients' E.E.G.s, in 2 of the parents' records, and in the E.E.G. of 1 sibling.

As has been mentioned above, the abnormalities witnessed in the records of the relatives of patients show the decline with age which occurs with the " constitutional " types of E.E.G. abnormality observed elsewhere. This decline with age is shown in the following table :

TABLE V.—*Relationship Between Age and E.E.G. Abnormality.*

Age.	Number of relatives.	Number of abnormal E.E.G.s.	Per cent. abnormal E.E.G.s.
41–60 years	44	3	7
21–40 ,,	30	9	30
0–20 ,,	14	5	35·5

The relatives over 60 years have been excluded as it was felt that their numbers were too few for comparison with the main groups The relationship indicated in Table V may indicate the occurrence of delayed maturation of the cortex. It is interesting to compare abnormality figures in the young adult group (16–30 years), in which 37 out of 45 patients belong. Fourteen of these patients (38 per cent.) had abnormal E.E.G.s compared with 9 out of 29 siblings (31 per cent.) and 3 out of 24 controls (12·5 per cent.). Thus when we match the groups most carefully in respect of age, the overall incidence of abnormality differs to a small extent between patients and their brothers and sisters, but much more considerably between these groups and the controls who are not closely related to schizophrenics. The numbers involved are not, however, large enough to provide statistical evidence that the difference is a significant one between the controls and the young adult siblings. When we turn to consider whether there is any concordance between the types of abnormality seen in the E.E.G.s of individual patients and those of their siblings, we find no definite indication that such concordance exists. Table VI shows the position :

TABLE VI.—*Concordance of Type Between the E.E.G.s of Patients and Siblings.*

Patients' E.E.G.s.	Siblings' E.E.G.s.			
	Normal.	Non-spec.	Fast/slow dys.	Paroxysmal.
Normal (25)	19	2	—	1
Non-spec. (8)	7	1	1	—
Fast/slow dys. (6)	5	4	—	—
Paroxysmal (6)	—	4	—	1

It would appear that among the relatives the characteristic E.E.G. patterns, whatever the patients' E.E.G. may present, are either normality, or else a non-specific dysrhythmia, usually of a mild type. On the other hand a definite relationship appears to exist between a normal E.E.G. of the patient and normality in the siblings' E.E.G.s, and, conversely, between abnormality in the record of the patient and his siblings. This is borne out by the next table :

TABLE VII.—*E.E.G. Status in the Families of Patients.*

Patients.	Siblings.		Parents.	
	Normal.	Abnormal.	Normal.	Abnormal.
Normal (25)	19	2	29	2
Abnormal (20)	12	12	14	1

Comparing the groups, those related to patients with normal and abnormal E.E.G.s respectively, we find that the difference between the groups as far as abnormality in the E.E.G. is concerned is considerable—there are relatively more abnormal E.E.G.s among the relatives of patients with abnormal records. The difference between the whole relatives' groups (i.e., parents plus siblings) shows a high degree of significance on the χ^2 test, when p is less than ·01. When the siblings only are considered, then p is ·02.

Two of the families of patients with abnormal E.E.G.s contained two siblings each with non-specific abnormal E.E.G.s. It was therefore desirable to make sure that these figures were not due to the inclusion of families with abnormally high abnormality rate as associated with, possibly, some specific condition. The next table shows the effect of excluding the two families.

TABLE VIII.—*E.E.G. Status minus the most "Abnormal Families."*

Patients.	Siblings.		Parents.	
	Normal.	Abnormal.	Normal.	Abnormal.
Normal (25)	19	2	29	2
Abnormal (18)	11	8	14	1

The result has been in the main to lessen the significance of the differences between the groups ; but with the χ^2 test, for the whole relatives' groups, we find that p is now ·016, and for the siblings only, p is ·045. The results remain significant at below the 5 per cent. level, so that it is not very likely that the presence of the two families is responsible for the increased E.E.G. abnormality rate in the relatives of patients with abnormal records.

The small number of parents with abnormal E.E.G.s made comparison between the records of their offspring and those of parents with normal E.E.G.s quite useless. In any case, many of the parents with normal or doubtful records may well, in their earlier years, have had abnormal E.E.G.s with patterns of a genetically determined type. On the other hand, it would be interesting to contrast the E.E.G. status of the families in which there is already a positive history of a serious psychiatric disorder with those in which there is no such history. Eleven families had a positive history.

TABLE IX.—*Family History and E.E.G. Status.*

	E.E.G. assessment.					
	Patients.		Parents.		Siblings.	
	Positive history.	Negative history.	Positive history.	Negative history.	Positive history.	Negative history.
Normal	5	20	6	37	7	24
Abnormal	6	14	—	3	8	6

Comparing the two groups of relatives, those with a positive and those with a negative family history, we find that the difference between them is significant as far as E.E.G. status is concerned, and that with the χ^2 test, p equals ·022. If only the siblings are included, then p equals ·051.

It was not possible to discover any relationship between type of schizophrenia encountered and E.E.G. abnormality in the relatives.

DISCUSSION.

The findings which we have reported appear to indicate that there is an incidence of E.E.G. abnormality in the total group of the near relatives of schizophrenic patients which is somewhat in excess of the expected rate for the whole population. The patients whose records we studied were young, recent cases, and the E.E.G. patterns and the observed incidence of abnormality encountered were comparable to those reported elsewhere. The control group was of an age which approximated to that of the sibling population, and the incidence of abnormality among the siblings was significantly greater than that of the control group. As with the abnormalities observed in the E.E.G.s of the patients, there is a falling-off with age, so that the proportion of abnormal E.E.G.s is greatest in the siblings, i.e. in the relatives under 45 years. In our series, the overall incidence of abnormal records among the siblings was not markedly different from that of the patients, though in general the severity of the abnormalities was much less. In the relatives the abnormal pattern was usually a mild, non-specific abnormality (whatever the abnormality in the patients' E.E.G.s). It must be observed, however, that the siblings of patients with abnormal records showed a much higher incidence of abnormality than was the case with the siblings of patients whose records were normal.

The results generally may be said to indicate that the pattern of the E.E.G. in a case of schizophrenia is to some extent determined by hereditary factors. The exact type of abnormal pattern does not appear to run in families under consideration, but a basic dysrhythmia does seem to be often encountered in those families in which the schizophrenic member has an abnormal record. Presumably in some respects the situation is similar to that obtaining in epilepsy. In this condition the abnormal patterns observed in the relatives of epileptic patients are of a " non-specific " type according to Gibbs, Gibbs and Lennox. In only 3·5 per cent. of 202 of these relatives was wave-spike activity seen, though this is a diagnostic or specific epileptic pattern.

The importance of hereditary factors in determining the E.E.G. appearance of a patient has been recognized in other neuro-psychiatric conditions. Thus Liberson and Sequin (1945) found that in a group of young patients under 23 years suffering from a wide variety of neuro-psychiatric disorders, 118 subjects in all, a negative family history was associated with a normal E.E.G. in the patients. About half of these patients were schizophrenics. Much work has been done to illustrate the effect of genetic factors on the E.E.G. pattern in epilepsy. Gibbs and Gibbs (1942) demonstrated that the E.E.G. pattern of 53 normal twins showed concordance agreeing with that of the physical characteristics of 87 per cent. On the other hand, the same workers (1942), using close relatives as well as twins, presented evidence that epileptic abnormalities—a " predisposition to convulse " are hereditary forms of dysrhythmia. Hill and Watterson (1942) observed that a relationship existed between a dysrhythmia in the E.E.G.s of aggressive psychopaths and bad temper in the near relatives. Gottlieb, Ashby and Knott (1946) noted that where head injury occurred together with a positive family history, the E.E.G. is more likely to be abnormal than when the head injury occurs alone. (The presence of a positive family history is not related to E.E.G. abnormality to a significant degree.)

Finally, from a neurological aspect, it is interesting to note that several writers, observing the frequency with which E.E.G. abnormality occurs in the families of sufferers from Huntington's chorea, have attempted to use the E.E.G. as a method of prediction of this illness, though their results have been somewhat equivocal (Harvald, 1951 ; Patterson, 1948).

We have mentioned some of the evidence that in a number of conditions the E.E.G. appearance can be influenced by genetic factors. The concordance of abnormality in the members of families affected is often not precise, as was the case in our material. Yet the weight of evidence supports the view that heredity is of importance in many neuro-psychiatric illnesses as far as the E.E.G. findings are concerned.

In this paper we have presented evidence to show that schizophrenia should be included among these conditions. On the other hand, our findings do not permit us to offer any theory as to the fundamental nature of schizophrenia itself.

Our best thanks are due to Dr. Dalton Sands, Physician-Superintendent of St. Ebba's Hospital, and to Dr. J. C. Batt, Deputy Superintendent, for their interest and encouragement in carrying out this investigation. We would also like to thank Dr. D. Hill, Dr. D. A. Pond and Dr. Eliot Slater of the Maudsley Hospital for their most helpful advice and criticism in the preparation of the material.

We wish to record our debt to Dr. M. Dawson of the E.E.G. Department, Belmont Hospital for her generous assistance in reading many of the records.

Finally we would like to express our appreciation of the work of Mr. Conway, the Recordist at the E.E.G. Department, St. Ebba's Hospital.

Owing to severe restrictions on space it has not been found possible to reproduce the E.E.G. tracings.

REFERENCES.

DAVIS, P. A., "Evaluation of the E.E.G. of Schizophrenia and Psychomotor Epilepsy," *Am. J. Psychiat.*, 1938*b*, **95**, 255.

Idem, "Evaluation of the E.E.G. Schizophrenic Patients," *ibid.*, 1939, **96**, 857.

GIBBS, F., GIBBS, E. L., and LENNOX, W. G., "Likeness of Cortical Dysrhythmias of Schizophrenia and Psychomotor Epilepsy," *ibid.*, 1938*b*, **95**, 255.

Iidem, "Cerebral Dysrhythmias of Epilepsy," *Arch. Neurol. Psych., Chicago*, 1938*a*, **39**, 290.

Iidem, "E.E.G. Classification of Epileptic Patients and Control Subjects," *ibid.*, 1943*a*, **50**, 1111.

GOTTLIEB, J. S., ASHBY, M. C., and KNOTT, J. R., "Primary Behaviour Disorders and Psychopathic Personality. Correlation of E.E.G. with Family History and Antecedent Illness and Injury," *ibid.*, 1946, **56**, 381.

HARVALD, B., "Predicting Huntington's Chorea," *Am. J. Psychiat.*, 1951, **108**, 295.

HILL, D., "Relationship of Schizophrenia and Epilepsy," *Fol. Psych. Neurol., Neurochir.*, Neerland Congress Number, 1948, 95.

Idem, ST. LOE, and THEOBALD, "Central Homeostatic Mechanism in Schizophrenia," *J. Ment. Sci.*, 1952, **98**, 9.

Idem and WATTERSON, D., "E.E.G. Studies of Psychopathic Personalities," *J. Neurol. Psych.*, 1942, **5** (N.S.), 47.

JASPER, H. H., FITZPATRICK, C. P., and SOLOMON, P., "Analogies and Opposites in Schizophrenia and Epilepsy," *Am. J. Psychiat.*, 1939, **95**, 835.

LENNOX, W. G., GIBBS, F. A., GIBBS, E. L., "Inheritance of Epilepsy as Revealed in the E.E.G.," *J. A. M. A.*, 1939, **113**, 1002.

Iidem, "Inheritance of Cerebral Dysrhythmia and Epilepsy," *Arch. Neur. Psychiat., Chicago*, 1940, **44**, 1155.

Idem, "Twins, Brainwaves and Epilepsy," *ibid.*, 1942, **47**, 702.

LIBERSON, W. T., and SEQUIN, C. A., "Brain Waves and Heredity in Mental Diseases," *Psychosom. Med.*, 1945*b*, **7**, 35.

WILLIAMS, D., "The Significance of an Abnormal E.E.G.," *J. Neurol. Psych.*, 1941, **4** (N.S.), 257.

INDIVIDUAL DIFFERENCES BETWEEN INTERVIEWERS AND THEIR EFFECT ON INTERVIEWEES' CONVERSATIONAL BEHAVIOUR.

By Frieda Goldman-Eisler, Ph.D.
Medical Research Council.
Unit for Research in Occupational Adaptation, Maudsley Hospital,
London, S.E.5.

[Received 17 April, 1952.]

I. Introduction.

Flexibility in adjustment on the part of the interviewer is commonly regarded as one of the main qualifications for good interviewing and part of an interviewer's skill. The high estimation of the spontaneity of the interviewing situation, which has been one of the main reasons why the interview as a technique has retained its popularity against more standardized and reliable methods, rests largely on the presupposition that skilled interviewers can adjust their own behaviour and steer the interviewing situation freely so as to obtain optimum rapport and maximum information. Thus Oldfield (5) considers changes of topic, attitute and tempo of great significance for the conduct of the interview. He particularly stresses the importance of changes of tempo ; pauses in the conversation, he says, if " badly chosen may easily break the trend of the relationship which is being built up. On the other hand, if well chosen, they may contribute markedly to the success of the interview." No evidence, however, exists to show to what extent skilled interviewers actually are free to adjust themselves to any particular interviewing task or which aspects of their interviewing behaviour are more subject to adjustment than others.

The present research is concerned with a particular approach to the study of interviewing based on the objective measurement from a chronograph record of the time sequences of activity (talk and gesture) and silence in conversation. Two press buttons, each setting off a separate pen drawing lines on a tape, are allotted to the two people in the conversation. As soon as a person speaks, nods, or smiles in response, the corresponding button is pressed down by the observer ; as soon as this person falls into inaction it is released (2). The lines drawn on the paper thus record the durations of the successive actions and silences for both partners in the conversation. These measurements are the basis for derived measures, such as the total amount of time of action or silence, the frequency or number of actions or silences, the average duration of actions or silences, the amount of time spent in mutual silence or double action, and the various relations arising from these data. This method was developed by E. D. Chapple (1). It was also described at greater detail by the writer in a previous article reporting an earlier experiment along these lines (4).

In the latter it was shown that conversational behaviour of individuals was consistent in respect of certain relationships between durations of actions (speech and gesture) and silences and their frequencies, independent of partner and topic. In the light of such a result the question of the degree and quality of interviewers' flexibility seems more than ever in need of clarification. Admittedly, the consistency of certain aspects of individuals' conversational behaviour under varying conditions is not transferable to interviewing. The situation recorded in the above experiment was such as to give scope for the free expression of personality in highly spontaneous interaction, while in interviews we are dealing with situations which, at least, demand far more controlled behaviour and considerable adjustment on the part of the interviewer. Nevertheless, the question remains whether, in fact, a skilled interviewer's flexibility is such as to open wider ranges of variation in his conversational behaviour, or whether, as was shown to be the case in the ordinary individual's conversations, his conversational activity remains confined within certain limits characteristic for the range of his personality. In the particular case of the psychiatric interview, the assumption is met with frequently that experienced psychiatrists' manner of speech and silence is the result of adaptation to the type of patient and to the needs of therapeutic and diagnostic situations. It may be asked whether this view can be maintained if examined in terms of the objective measurements of the time taken up in speech and silence.

An experiment was designed to throw light on this problem, and also on that of the influence, if any, of different interviewing styles, on patients' reactions. As to the latter point the question presenting itself is whether the amount of time taken up in speech, the duration of the individual periods of talk and silence, the timing and frequency of interruptions or silences, create reactive attitudes in the interviewee which manifest themselves in the amount of information given, in the manner of responding to the interviewer, and the quality of information yielded. (The question of the relation of time to quality of information is not dealt with in this paper.)

II. Experiment.

Three senior psychiatrists of the Maudsley Hospital (who will be referred to as D1, D2, and D3), took part in the experiment. They were chosen for the experiment on the basis of a judged difference in their conversational activity, the experimenter predicting essentially different scores for D1 on the one hand, and D2 and D3 on the other. A group of patients, five reserved (four cases of depression and one of uncertain diagnosis), and five talkative (four cases of anxiety, and one uncertain), were then selected to be interviewed by all the three doctors in rotation. There were thus 30 interviews altogether. Any errors arising from the order of interviewing, that is, from the fact that patients would respond differently according to whether they were interviewed for the first, second, or third time irrespective of the interviewers, were controlled by randomizing the order. The three interviewers were thus compared against a constant stimulus background.

Further, in order to make the interviews comparable a common aim was set, namely to give a description and diagnosis of the patients' present mental state. The doctors were, within those limits, given freedom to suit their own personal technique and approach. Care was also taken that none of the doctors concerned should have seen any of the patients previously. Just before each interview took place the doctor was given a short summary of the patient's history to read, exclusive of any information imparted by the doctor in charge about the patient's present mental state. Interviewing patients in order to diagnose their mental state is for psychiatrists at a mental hospital very much a routine procedure, and apart from the above experimental safeguards they acted in much the same way as they are used to in their day's work.

These interviews were also recorded on a speech recorder with a view eventually to relating the time aspect of conversational behaviour to the content This material will be reported elsewhere.

Measures.

The data contained in the chronograph record, that is, the durations and frequencies of actions and silences, were combined into the following relationships :

(a) the bs/ds ratio, bs designating the number of silences below five seconds and ds the number of silences above five seconds.

(b) the amount of action time, i.e. the percentage of the total time spent in action by each speaker during the whole interview, which we shall call AT, and

(c) A + S, i.e., the average time, in seconds, elapsing from the starting of one action to the starting of the next and comprising an action and its subsequent silence. (Obviously each action is followed by a silence.)*

III. Results.

The bs/ds Ratio.

The bs/ds ratio in interaction gives us the proportion of the number of short silences to long silences. This time the definition of short and long silences was different from that in our first experiment. Long silences were those above five seconds instead of twenty seconds, a change derived from the fact of the quicker alteration of question and response in the interview than in ordinary conversation and confirmed by our inspection of the frequency distributions of duration of actions and silences. If the numerator contains the frequency of short silences and the denominator that of long ones, it means that a small bs/ds value indicates a proportionately large number of long silences and a large value a small one. Or, in other words, a person who listens for long periods would have a small value while one who could rarely maintain silences lasting longer than five seconds would have a high value for bs/ds. That is, he would have a poor listening ability or a high level of conversational activity.

---

* Chapple termed this period an "interaction unit" on the assumption that each silence coincided with the partner's response, thus representing a kind of stimulus-response arc in conversational interaction. This condition, of course, holds only where there is good adjustment.

In our previous experiment (4) measuring the times of actions and silences in seven series of conversations between normal subjects whereby seven individuals talked with ten different partners, the bs/ds ratio proved to have considerable stability for individuals under varying conditions, i.e. changing topics and partners in conversation.

The question was whether in the changed circumstances of this experiment and with the different type of personnel involved, (i.e. psychiatrist and skilled interviewer on the one hand and patient on the other), the above result could be confirmed. Would the interviewer show a consistent tendency with respect to the proportions of long periods of silence in his speech no matter what type of patient he interviewed ? Would patients' conversational activity as measured by the bs/ds ratio retain its basic tendency independent of the interviewer, whoever he was ?

The means and standard deviations of the bs/ds scores for the three interviewers are given in Table I.

TABLE I.

	Mean bs/ds.	σ.
D1	1·78	0·68
D2	3·79	3·55
D3	4·21	1·26

Diagram I shows the frequency distribution for each of them.

How far the tendency of these measures to be concentrated within a definite range for each of the interviewers was significant was tested by an analysis of variance. As the bs/ds scores had a skewed distribution they needed to be normalized and their variance equalized in order to satisfy the necessary assumptions for this procedure. This was done by transforming them into logarithms. The mean log bs/ds scores are shown in Table II.

TABLE II.

	Mean log bs/ds.	σ.
D1	0·434	0·079
D2	0·611	0·226
D3	0·707	0·079

An analysis of variance of the interviewers' log transformations of bs/ds scores (Table III) takes account of three sources of variation : the interviewers, the type of patient interviewed, i.e., whether he belonged to the reserved and depressed, or the talkative, anxious group, and any possible interaction between the two. The division into the two groups was made on the basis of the judgment of the psychiatrist in charge.

It will be seen that the variation between the interviewers is well beyond the one per cent. level of significance. The interviewers' mean scores are, however, not affected to any significant extent by the extreme differences in talkativeness displayed by the two groups of patients. The interaction variance is also insignificant, and about equals the error variance. It can therefore be concluded that interviewers tend to be consistent in their conversational behaviour as measured by the bs/ds ratio, if by consistent is meant that there is considerable reliability for this behaviour under comparable stimulus conditions.

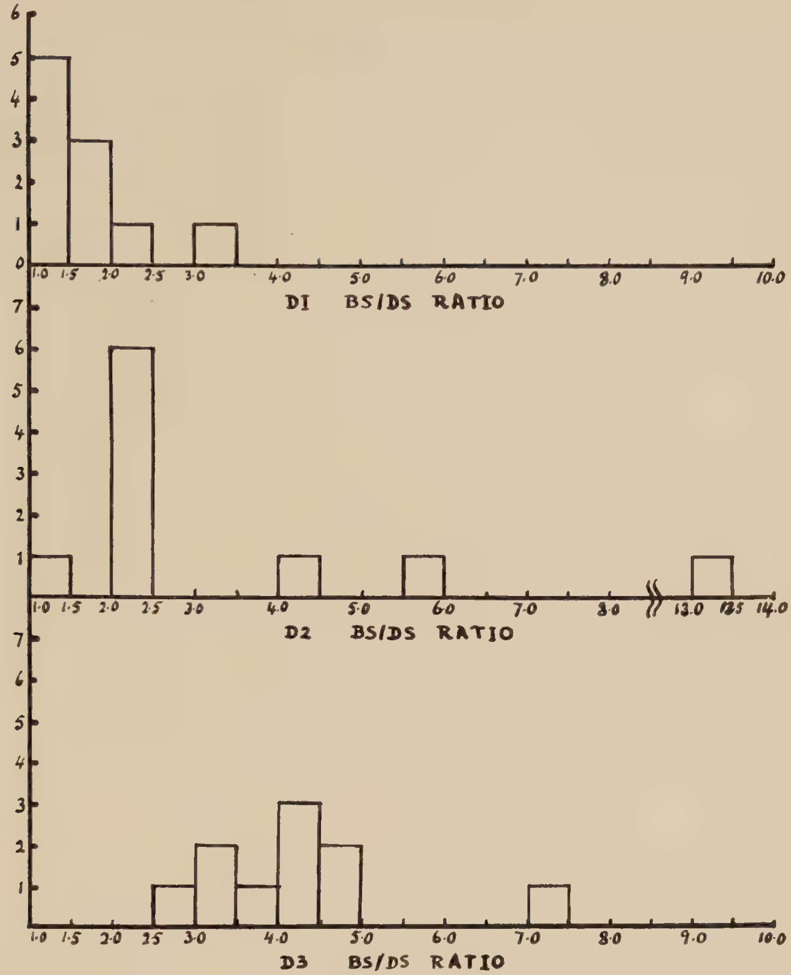


DIAGRAM I.—Frequency distributions of bs/ds ratios for D1, D2, D3.

TABLE III.—*Analysis of Variance on Interviewers' Log Transformations of bs/ds Scores.*

Source.	Degree of freedom.	Sum of squares.	Mean square.
Between interviewers	2	·382	·191
Between groups of patients	1	·060	·060
Interaction (Interviewers × patients)	2	·048	·024
Error	24	·541	·023
	29	·031	

Interviewers/Error . F = 8·30 (F for 2 and 24 dfs at ·01 level = 5·61; at ·001 level = 9·34).

Groups of patients/Error F = 2·61 (F for 1 and 24 dfs at ·05 level = 4·26.)

The Interviewees (Patients).

The question of the stability of conversational activity (bs/ds) on the part of the interviewees as well as that concerning the effect of the interviewer on the conversational activity of the interviewee must be considered, bearing in mind that the interviewing situation between doctor and patient establishes for the doctor by its very nature a position of dominance and initiative.

To answer this question the ten patients interviewed were again divided into the two groups of depressed and talkative individuals. The two groups were relatively homogeneous within themselves. Their mean activity scores (log transformations) were analysed for the effect of the interviewers.

TABLE IV.—*Analysis of Variance of Patients' Log Transformations of bs/ds Scores.*

Source.	Degree of freedom.	Sum of squares.	Mean square.
Between interviewers	2	·407	·204
Between groups of patients	1	1·620	1·620
Interaction (Interviewers × patients)	2	·055	·028
Error	24	·807	·034
	29	2·889	

Between interviewers/Error . F = 6·05 (F for 2 and 24 dfs at ·01 level = 5·61.)

Between groups of patients/Error F = 47·65 (F for 1 and 24 dfs at ·001 level = 14·03.)

The analysis given in Table IV shows that the variation of the patients' bs/ds log scores comes from two significant sources, the bulk of it being accounted for by the differences between the two groups of patients and being independent of the interviewer. However, another source of variation in the patients' scores, though not of such high significance, is the differences between the three interviewers. That is to say, while the personalities of the patients find consistent expression in their conversational activity as measured in terms of the log bs/ds ratio, their bs/ds log score taken separately for each of the two groups of depressed and talkative patients shows modifiability under their interviewers' influence to a significant extent. This is indicated by the means in Table V.

TABLE V.

	Mean log bs/ds.		
	D1.	D2.	D3.
Depressed	1·844	2·127	2·873
Talkative	4·268	3·895	5·665

In other words, with respect to the bs/ds ratio the interviewees have responded to the varying approaches of the different interviewers, although within the limits set by their own personality.

Amount of Action.

It is a common observation that some people consistently talk more than others irrespective of whether their individual periods of action are of short or long duration. AT, i.e., the amount of time spent in action or the total sum of all the periods of action in an interview measures this aspect of activity in conversation.

The question was asked in what way the amount of action taken as a whole might actually be influenced as a result of interaction, and to what extent any individual tendency relating to this aspect could maintain itself with different partners in the interview, and for the different roles of interviewer and interviewee.

Although the doctors had been asked to make all interviews last 30 minutes, they did not follow the instruction and there was considerable variation in the lengths of interviews as shown below:

	Mean time of interviews (in minutes).	Range.	σ.
D1	22·9	15·7–35·2	5·37
D2	22·7	18·8–27·6	2·20
D3	17·3	9·6–30·8	7·76

There had been perfect readiness on the part of the doctors to comply with the instruction concerning the length of interviewing, and their difficulty in keeping it the same with different patients seems to indicate that a natural and spontaneous interviewing style is not easily compatible with a rigid time limit, and that, among other aspects, the total time of interviewing seems to be also affected by adjustment in interaction.

The absolute time of total action for doctors and patients was therefore transformed into percentages taken from the total interviewing time. These percentages do not necessarily add up to 100 per cent. for it is quite possible that long spells during the interview are passed in mutual silence, in which case the summed action time would amount to less than 100 per cent., that on the other hand there are periods during which both parties talk simultaneously, in which case, the action time of both would sometimes add up to more than 100 per cent.

The question of the consistency of behaviour of individuals with respect to their total action time in interviews was thus investigated on the basis of relative and proportionate rather than of the absolute and actual time.

In order to answer this question an analysis of variance was carried out for both interviewers and patient. Again, in order to satisfy the assumptions for this procedure the percentages of total time had to be transformed into angles (of Fisher and Yates, 3).

TABLE VI.—*Analysis of Variance of AT (Amount of Time Spent in Action by Interviewer) Based on Angular Transformations of Percentages of Total Time.*

Source.	Degree of freedom.	Sum of squares.	Mean square.
Between interviewers	2	463·24	231·62
Between groups of patients	1	667·41	667·41
Interaction (Interviewers × patients)	2	38·90	19·45
Error	24	632·13	26·34
		1801·68	

Between interviewers/Error . F = 8·79 (F for 2 and 24 dfs at ·01 level = 5·61 ; at ·001 level = 9·34.)

Between groups of patients/Error F = 25·34 (F for 1 and 24 dfs at ·001 level = 14·03.)

From the analysis in Table VI we can see that the differences of the mean AT (angles) have two highly significant sources. Primarily the amount of time spent in action by the interviewers depended on the type of patient interviewed. All three interviewers decreased the volume of their conversation as they passed from the depressed to the talkative patients, but while they adjusted themselves to the different types of patients their *relative* talkativeness remained constant. As may be seen from Table VII, the decrease in AT when passing from the depressed to the talkative patients, varies only little around 40 per cent.

TABLE VII.—*AT Values of Interviewers, D1, D2, D3, Talking to Depressed and Talkative Patients.*

	Depressed patients.	Talkative patients.	Decrease of AT from depressed to talkative (per cent.).
D1	25·6	15·4	40
D2	45·8	25·0	45
D3	35·8	23·0	36

Thus while the adjustment from one group of patients to the other was a radical one it was general and took place from the baseline of each individual interviewers' conversational personality leaving the mutual relation between the interviewers intact.

The AT values for the three interviewers were in the very similar proportions of 1 : 1·77 : 1·38 for the depressed and 1 : 1·62 : 1·49 for the talkative patients. Diagram II illustrates this position graphically.

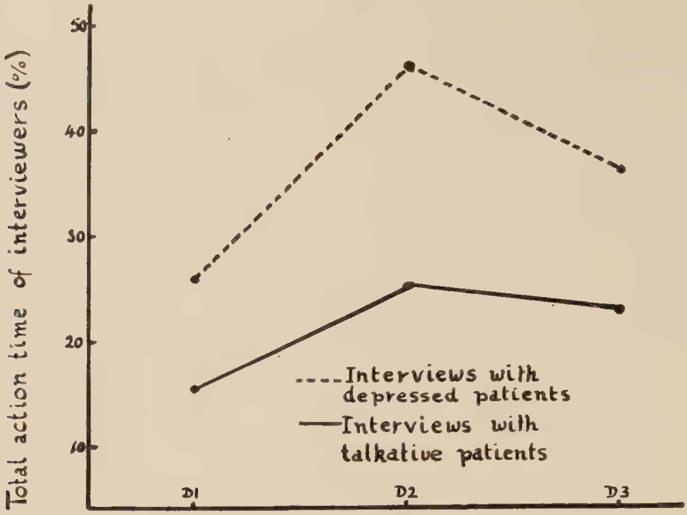


Diagram II.

With respect to the amount of talk on the part of the patients, our expectations were guided by the following line of reasoning. If variation due to the influence of the partner in conversation means adjustment, extreme invariance or constancy would indicate the opposite, namely rigidity. We might therefore expect that the amount of talking done in the interview by maladjusted people, as patients are, would be less dependent on the individual interviewer than the interviewer's total action time had been on the type of patient interviewed. That our data are in line with this expectation is shown in Table VIII.

Table VIII.—*Analysis of Variance of AT* (*Amount of Time Spent in Action by Patients*) *Based on Angular Transformations of Percentage of Total Time.*

Source.	Degree of freedom.	Sum of squares.	Mean square.
Between interviewers	2	79·88	39·94
Between groups of patients	1	5116·11	5116·11
Interaction (Interviewers × patients)	2	89·79	44·90
Error	24	1499·20	62·47
		6784·98	

Interviewers/Error . . F = 0·64 (F for 2 and 24 dfs at ·05 level = 3·42.)

Groups of patients/Error . F = 81·9 (F for 1 and 24 dfs at ·001 level = 14·03.)

The analysis in Table VIII shows that the only significant source of variation is the patients themselves. The variation in the amount spoken by patients due to any influence of the interviewer is less than error, that is less than the variation in interviews with the same interviewer from patient to patient within the same patient group. In other words, the patients have, as a group, rigidly resisted stimulation and have remained unadjusted within the very narrow limits of their basic activity. However, before we may draw any conclusions to the effect that individual styles of interviewers make little difference to the amount of talk elicited, examination of our data in greater detail may be rewarding. We thus find (Table XII), that while the talkative group seems to be little affected, the mean AT values for the depressed group vary from interviewer to interviewer, D1 eliciting least in amount, and D3 most. The F ratio (0·64) based on both groups of patients was not significant.

Conversational Tempo.

By "tempo" in conversation we mean the alternation between the periods of action and silence. The quicker a person changes over from action to silence and from silence to action, the more numerous will be the A + S periods (average action plus average silence), or "interaction units." The more numerous these periods are, i.e., the more often a person starts talking, or ceases to be silent, the shorter the durations of these periods will be. Our measure of conversational tempo which is derived from Chapple's Speed Curve (1), will therefore be the average action plus average silence (A + S), i.e., the average time elapsing between the starting of each action and the next. As previously this measure was subjected to an analysis of variance for interviewers as well as for patients.

TABLE IX.—*Analysis of Variance of A + S (Conversational Tempo) for Interviewers.*

Source.	Degree of freedom.	Sum of squares.	Mean square.
Between interviewers	2	56·12	28·06
Between groups of patients	1	0·17	0·17
Interaction (Interviewers × patients)	3	11·28	3·76
Error	23	68·91	3·00
	29	136·48	

Between interviewers/Error . F = 9·35 (F for 2 and 23 dfs at ·01 level = 5·66; F for 2 and 23 dfs at ·001 level = 9·47.)

Between groups of patients/Error F = 0·05 (N.S.)

TABLE X.—*Analysis of Variance of A + S (Conversational Tempo) for Patients.*

Source.	Degree of freedom.	Sum of squares.	Mean square.
Between interviewers	2	21·28	10·64
Between groups of patients	1	7·01	7·01
Interaction (Interviewers × groups)	3	4·11	1·37
Error	23	111·95	4·87
	29	144·35	

Between interviewers/Error . F = 2·4 (F for 2 and 23 dfs at ·05 level = 3·42.)

Between groups of patients/Error F = 2·0 (F for 1 and 23 dfs at ·05 level = 4·28.)

As far as the interviewers' scores are concerned there is only one significant source of variation: the differences between the interviewers themselves. These are approaching the 0·1 per cent. level of significance. Thus, of the three aspects of conversational behaviour so far considered, conversational tempo as measured by A + S is the most consistent one as the interviewer moves from patient to patient, and it does not enter into his adjustment process.

For patients, however, the situation is different. The two main sources of variation, i.e., interviewers and the patient groups, do not reach significance, and we have a large error variance. The interaction variance being quite insignificant the possibility presents itself that (a) the groups are not as homogeneous with respect to A + S as with the other measure, and (b) that while interviewers seem to have an influence on some patients' conversational tempo, others remain unaffected. An inspection of Diagram III showing the A + S scores of doctors and patients side by side for each interview illustrates the degree of flexibility for each patient under the influence of each doctor.

Obviously there are great individual differences with respect to the pliability of patients' conversational tempo in their response to the interviewers' tempo. For example, P1, P2, P3, P6, and P7 seem more flexible in adjusting themselves; while P5 and P9 seem quite rigid and unresponsive. This observation invites speculation

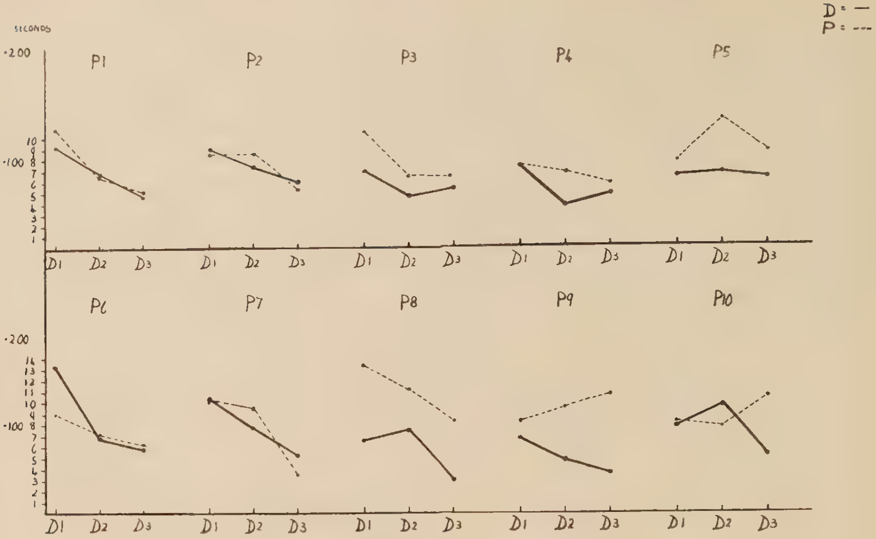


Diagram III.—A + S Scores for doctors (D) and patients (P).

as to the diagnostic significance of the degree of flexibility in social interaction as measured by the response to changes in timing. However, our data so far are too scanty to support any suggestion even at the speculative level.

The fact that there is flexibility in the patients' scores while those of the interviewers do not vary with the different patients is not unexpected. There are three ways in which the average length of an A + S unit may be modified. A period of activity may be cut short in interaction by interruption, or a period of silence shortened by prodding or encouraging. Both these modifications are possible only as a result of active interference in the natural timing of actions and silences.

The interviewer being, in the nature of things, the active element in the interview situation, has the initiative, enabling him to effect the interviewee's timing. In the usual way, he himself of course would be suffering little external interference.

Besides, little internal manipulation or control of the timing of talk and silence was exercised by the three interviewers recorded; whereas, with respect to the amount of time spent in talking, interviewers had exercised control and showed themselves flexible in adjusting to the different types of patients.

The reason for this contrast might perhaps be sought in the fact that an individual is usually more conscious of how much he talks over the whole conversation than of how often he starts and stops talking, and a conscious form of behaviour is more easily controlled than one that is unconscious.

Individual Differences between the Three Interviewers, D1, D2, D3.

The three interviewers in the experiment were selected on the basis of different activity rates as judged by the experimenter. Thinking chiefly in terms of the bs/ds ratio, D1 on the one hand, and D2 and D3 on the other, were considered to represent two essentially different activity levels. It was also felt that differences existed with respect to some other aspects of conversational activity but this could not at that stage be clearly defined.

An analysis of our data was undertaken with a view to ascertaining the extent and nature of interviewers' individual differences as regards conversational activity (bs/ds log score), and conversational tempo (A + S).

For this purpose "t"-tests were computed examining the differences of means between each of the three interviewers with respect to the above measures. The results are given in Table XI.*

---

* It should be noted that as we are testing all the possible differences between these means the comparisons were not independent and that therefore the significance levels are slightly inflated.

TABLE XI.—*Interviewers' Score.*

	Activity level / Log (1 + bs/ds).		Amount of time (AT). / Angular transformations.		Tempo / A + S (in seconds).	
	Mean.	σ.	Mean.	σ.	Mean.	σ.*
D1	0·434	0·079	26·68	2·22	8·32	2·00
D2	0·611	0·226	36·24	7·26	6·60	1·57
D3	0·707	0·079	32·43	6·51	4·97	0·54

"*t*'s" for mean differences.

	D1–D2.	D1–D3.	D2–D3.
Log (1+bs/ds)	$t=2\cdot85$ ($P=\cdot02$)	$t=6\cdot66$ ($P=\cdot001$)	$t=3\cdot11$ ($P=\cdot02$)
AT (angular transformations)	$t=3\cdot96$ ($P=\cdot01$)	$t=2\cdot52$ ($P=\cdot05$)	$t=1\cdot35$
A + S	$t=2\cdot40$ ($P=\cdot05$)	$t=5\cdot32$ ($P=\cdot001$)	$t=3\cdot66$ ($P=\cdot01$)

From Table XI we can see that D3 leads in conversational activity (bs/ds) and tempo (A + S), but is second in the amount of his activity (AT) to D2. In other words his pressure for activity is high, there is a relatively small proportion of silences over five seconds, and his conversational tempo is a quick one. In fact, not only does he not keep long silences, he is also quick in terminating his actions. In the actual amount of action, however, it is D2 who leads. When we consider the differences between the three interviewers we can see that the greatest contrast prevails between D3 and D1, the means being significantly different at the ·001 level of probability on two counts, log (1 + bs/ds) and A + S, and the ·05 level on one, namely AT. The difference between D1 and D2 also reaches high significance although for log (1 + bs/ds) and A + S at a lower level of probability. AT discriminates between D1 and D2 at the ·01 level of probability. D2 and D3, on the other hand, belong as far as AT is concerned to the same population universe, while they differ significantly in respect of their pressure for conversational activity (log 1 + bs/ds) and of tempo (A + S). D1, however, seems to represent an altogether different conversational type. This manifests itself in his ability to listen and to wait for responses for considerably longer periods (bs/ds), than D2 and D3, in the smaller amount of time taken up in speech (AT), and in his tempo in conversational interaction (A + S).

The Validity of Interviewers' Scores.

It was with some hesitation that we decided to use, as an alternative for bs/ds and A + S, designations beyond their operational description, namely conversational "activity level" and "tempo". It was felt that while the operational description corresponded to a considerable extent to what was usually meant by these concepts an external validation was needed to test the justification of such terminology as well as to illuminate the relation of conversational activity and tempo to activity and tempo in general behaviour. Therefore seven psychiatrists of the hospital, who are in daily contact with the three interviewers, were asked to rank them for speed or tempo and five of these psychiatrists (the other two were not available at the time) to rank them for activity level. All seven ranked D3 first in speed making remarks to the effect that D3 far exceeded D2 as well as D1 in this respect. Four psychiatrists ranked D2 second and D1 third, and three D1 second and D2 third. The values for tempo in Table XI show that this proportion corresponds to the position of the time measurements. The tempo scores for D3 are significantly different from those of D2 and D1. D2 has a quicker tempo than D1, but the difference is not highly significant,

---

* If the readings of the three doctors for the *i*th patient ($i = 1, 2, \ldots p$) are denoted by x_i, y_i, and z_i respectively the estimate of the first doctor's error variance, which has been used is σ

$$\frac{1}{(p-1)}\left(\frac{7}{6}\sum_{i=1}^{p}(x_i-\bar{x})^2+\frac{1}{6}\sum_{i=1}^{p}(y_i-\bar{y})^2+\frac{1}{6}\sum_{i=1}^{p}(z_i-\bar{z})^2-\frac{1}{6}\sum_{i=1}^{p}(x_i+y_i+z_i-\bar{x}-\bar{y}-\bar{z})\right),$$

when $\bar{x}$, $\bar{y}$, and $\bar{z}$ are the mean values (over p readings) of the x_i, y_i and z_i; similarly for the second and third doctors (2).

a situation corresponding to the disagreement among the judges with a majority ranking D2 first.

Also five judges were asked to rank the three interviewers for activity level or energy and did so with complete unanimity in the following order: D3, D2, and D1. The order is the same as that of their bs/ds scores.

Modification of Patients' Score effected by Individual Interviewers.

Having described the three interviewers in the experiment in terms of our three measurements we are now in a position to examine further the question of patients' variability or flexibility with reference to the influence of individual interviewers.

Table XII gives the mean values for both groups of patients for their interviews with each of the doctors.

TABLE XII.—*Patients' Scores.*

	Patients.		
	D1.	D2.	D3.
Reserved (depressed) . .	1·844	2·127	2·873
Talkative (anxious) . . .	4·262	3·895	5·665
	6·106	6·022	8·538
AT (angular transformations):			
Reserved (depressed) . .	134·2	158·3	174·6
Talkative (anxious) . .	288·9	282·5	287·3
	423·1	400·8	461·9
A+S (tempo):			
Reserved (depressed) . .	149	134	107
Talkative (anxious) . .	163	158	132
	156	148	119

The above table shows that for all three measures D3 has the greatest modifying influence. In other words, the interviewer with the highest bs/ds ratio (conversational activity) and the lowest A + S score (quickest tempo) seems to elicit in the patient not only a characteristically higher activity (bs/ds) and a quicker tempo of response (A + S), but also a greater amount of action (AT). However, it must be kept in mind that only with respect to log (1 + bs/ds) did the interviewers' influence prove to be a significant source of variation. Examining the two separate groups of patients, it will also be observed that with respect to AT, this influence extends to the depressed group only, the anxious group talking most with D1 who himself talked least of the three. This points to the possibility that there may be different optima for interviewers' conversational activity according to the different types of patients. Thus it would seem from the above that the depressed patient responds best to active stimulation, and the one who talks easily gets the best chance with the passive interview technique. This would, of course, refer only to the amount of time spent by the patient in talking. The question of the value, and level of the information elicited can be answered only after the analysis of the content of these interviews which will be reported elsewhere.

IV. SUMMARY.

1. Individuals had previously been shown to be relatively consistent in conversational behaviour with respect to certain relations in the duration of their actions (talk and gesture) and silences which can be measured objectively.

2. The question arose whether trained interviewers could adjust their conversational behaviour, as measured in the above terms, when dealing with different types of interviewees achieving greater flexibility than was the case in normal conversation, or whether for them, these time relationships remained constant irrespective of the interviewee.

Linked with this was the question of the influence of different interviewing styles on the interviewee's conversational behaviour as measured in the above terms.

3. An experiment was designed in which three senior psychiatrists interviewed a group of ten patients, five reserved and five talkative ones. There were 30 interviews altogether, each patient being interviewed by each of the three interviewers in rotation. The common aim set for these interviews was the assessment and diagnosis of their mental state.

4. Three measures were used to answer the above questions: (*a*) The logarithmic transformation of the bs/ds ratio, bs signifying the number of short silences below 5 seconds and ds the number of long silences exceeding 5 seconds; (*b*) the angular transformation AT, the total amount of time which was spent in action (talk and gesture), expressed as a percentage, and (*c*) A + S, the average period comprising an action plus its subsequent silence. bs/ds was also referred to as conversational activity and A + S as conversational tempo.

5. The statistical method used in the treatment of the data was that of analysis of variance.

6. Interviewers showed themselves consistent irrespective of the type of patient interviewed with respect to bs/ds and A + S. Concerning AT they showed themselves consistent in relation to each other, but all adjusted themselves about the same amount when passing from one group of patients to the other.

7. The patients' conversational behaviour was consistent with respect to bs/ds (log (1 + bs/ds)), and AT (angle AT); while the latter value, i.e., the amount of time spent in talking, proved independent of the interviewers, the bs/ds log score showed itself sensitive in response to the individual interviewers. The analysis of variance dealing with the patients' conversational tempo yielded no significant results.

8. To test the justification of applying the designations of activity level as bs/ds and of tempo A + S, the interviewers were ranked for activity level and tempo in general by other psychiatrists in the same hospital. Their rankings and rank order of the scores were in complete conformity.

9. The individual differences between the three interviewers with respect to the measures used in this investigation were described in terms of the *t*-test and examined with reference to any possible modifying effect on the patients' conversational behaviour. The interviewer with the highest activity level (bs/ds) and quickest tempo (A + S) in conversation had the greatest modifying influence on the patients' conversational activity level (bs/ds) and on their tempo (A + S).

Acknowledgments.

Grateful acknowledgment should be made to the three psychiatrists whose co-operation made this experiment possible. I am particularly indebted to Professor Aubrey Lewis for the stimulation he gave to this work and his suggestions all the way through. Mr. A. Jonkheere and Miss J. D. May must also be thanked for their advice and assistance in the statistics of this experiment, and Mrs. M. Malloy for her assistance in carrying out the experiment and recording the interviews.

I should also like to thank Dr. H. J. Eysenck for kindly reading and commenting upon the draft of this paper, as well as Mr. A. G. Lewis for his careful corrections of the manuscript.

BIBLIOGRAPHY.

(1) CHAPPLE, E. D., and DONALD, G., Jr., "A Method for Evaluating Supervisory Personnel," *Harvard Business Rev.*, 1946, **24**, 197–214.

(2) EHRENBERG, A. S. C., "The Unbiassed Estimation of Heterogeneous Error Variances," *Biometrica*, 1950, **39**, 347–357.

(3) FISHER, R. A., and YATES, F., *Statistical Tables for Biological, Agricultural, and Medical Research.*

(4) GOLDMAN-EISLER, F., "The Measurement of Time Sequences in Conversational Behaviour," *Brit. J. Psychol., Gen. Sec.*, 1951, **42**, 355–362.

(5) OLDFIELD, R. C., *The Psychology of the Interview*, 1941. London: Methuen.

MIGRAINE PATIENTS: A DISCUSSION OF SOME TEST RESULTS.

By A. Kaldegg, Ph.D., B.A.

From the Department of Psychological Medicine, Guy's Hospital, London.

[Received 4 March, 1952.]

Research was carried out by a small unit in the York Clinic at Guy's Hospital into the possible connection between migraine attacks and the patient's emotional life. The hypothesis was that migraine was a product of stress and should, therefore, respond to psychotherapy directed towards helping the patient to deal with his emotional problems in a more adequate way. The clinical aspects of the investigation and therapy are described in full elsewhere (2, 3). Evidence was produced to support the view that migraine is a stress disorder. Contact was kept with all the patients for a period ranging from 2 months to 2½ years. In a series of 20 patients eight patients were much improved by therapy, ten improved and two remained unchanged. This paper presents the results of some of the psychological tests which were applied to those 20 patients.

All the patients in the series were given two intelligence tests, Raven's Progressive Matrices (12, 13) and the Wechsler-Bellevue Intelligence Test (20), and two projective tests, the Rorschach (14) and the Mosaic (8). Sixteen of them were also given the TAT (Thematic Apperception Test) (18). The Progressive Matrices were self-administered, the other tests were administered by the writer in three sessions. The TAT and the Mosaic test made a valuable contribution to the understanding of the patients' personality, but owing to the lack of a validated scoring system for these tests, which renders direct comparison of results difficult, only the results of the Progressive Matrices, the Wechsler-Bellevue scale and the Rorschach test will be discussed here.

Material.

The group consisted of 16 women and 4 men. Nine were outpatients, 11 inpatients. The age range was 18 to 51, median 36. The exact distribution is given below:

Under 20.	20–29.	30–39.	40–49.	50–51.
1 (male)	6 (incl. 2 male)	5	5 (incl. 1 male)	3

Three had a grammar school education, all the others had left school at the age of 14 or 15. Ten of the women and 2 of the men were married or widowed and, with the exception of 2, had children of their own. The occupations varied from bank clerk to charwoman. All the married women had done work other than housework at one time or other, or were still thus occupied.

Eleven patients were referred to the research unit by general practitioners in the area; 9 by physicians in other departments of the hospital. Headache, nausea or vomiting, and prostration were taken as the criteria for diagnosis of migraine. As reported in "Migraine as a Stress Disorder" (3), 19 patients in the series had all these three signs, one had headache, teichopsia and prostration only. Some disturbance of vision was reported by 12 patients. Other symptoms, apart from headaches and migraine attacks, were present in 11 patients; dysmenorrhoea in 3, menorrhagia in 2, bodily pains in 3, neurodermatitis in one, and alopecia areata in one. Three patients complained of spells of depression, and one of anxiety attacks. Two patients had multiple symptoms; one of these was a "chronic invalid."

No control group was tested specially for comparison with the migraine patients. For the Wechsler-Bellevue test the control group of another investigation (4) was found to agree well with the migraine group in age range and distribution of I.Q. and the results obtained with that group could be used for comparison. The Rorschach test results were compared with those of a series of duodenal ulcer patients reported on in a previous paper (5).

Are Migraine Patients above Average in Intelligence?

The question cannot be answered satisfactorily on such a small group, but in view of the widespread belief that proneness to migraine is related to intelligence, it seemed important to pay special attention to intelligence testing. Two intelligence tests, the Progressive Matrices (referred to in the following as "Matrices") and Wechsler-Bellevue were given.

The results of the Matrices are given below.

(The figure before the stroke represents the case number, the figure after the stroke the age of the patient in years. The same method of recording is used for the Wechsler test results to enable the reader interested in the agreement between the two tests to compare the results case by case).

Matrices Grade.

III−	III+	II	II+	I
5/49	2/44	1/35	9/51	8/29
7/29	3/32	4/45	10/51	14/18
11/26	6/31	12/20		
18/50	16/30	13/47		
	17/37	15/29		
		19/28		
		20/42		
4	5	7	2	2

The variability, i.e., the sum of the deviations from the norms, of the scores for the Matrices sets A, B, C, D, E was calculated. With the exception of two cases all the patients had a variability of 6 points at the most and nowhere was a deviation of 2 points exceeded.

The Full Scale I.Qs. obtained on the Wechsler-Bellevue test were as follows:

Wechsler Full Scale I.Q.

96–100	101–105	106–110	111–115	116–120	121–125	126–130	131–135	136–140
2/44	5/49	3/32	9/51	1/35	4/45	8/29	19/28	14/18
	11/26	7/29	10/51	6/31	13/47	..	..	20/42
	12/20	17/37	..	15/29				
	18/50	16/30						
1	4	4	2	3	2	1	1	2

Mean: Migraine group: 115·2 (controls: 114·10)
SD ,, ,, 11·48 (,, 13·11)
$p > \cdot 50$

Comparing the results of the Matrices and the Wechsler test case by case, it appears that the plus and minus grading of the Matrices account for a number of discrepancies. If one leaves aside the subtleties of plus and minus and assumes that Matrices grade III covers a range from 90 to 110 Wechsler Full Scale I.Q., Grade II a range from 111 to 125, and Grade I above 125, one is left with four cases for which the results of the two tests do not agree. For 6/31, 19/28 and 20/42 the Matrices score is one grade lower than the Wechsler, for 12/20 it is one grade higher.

There is on the whole a fair agreement between the two tests and one may reasonably hold that the results are comparable. Both tests show that, although 4 patients on the Matrices and 5 on the Wechsler scored average or average towards dull, the remainder scored above average with a strong contingent of definitely above average, as the median 113·5 shows. Prima facie the findings seem to confirm the view that migraine patients tend to be above average in intelligence. Against this it has, however, to be said that a group of patients exhibiting various psycho-somatic disorders which had been investigated before (4) had a rather similar distribution. After excluding from it the two migraine patients which are now members of the present series there were 12 patients out of 18 with a Wechsler Full Scale I.Q. of more than 106. This rather suggests the possibility that individuals who are prepared to come to a psychiatrist for treatment of what appears to the majority of people a somatic disorder, and who are willing as a condition of their admission to submit to all sorts of tests, tend to be above average in intelligence. There may be, therefore, a selective element at work which, in the case of migraine, is likely to be reinforced by cultural factors. Like the common cold a " headache " until recently did not belong to the illnesses for which in lower middle class and working class homes it was thought necessary and proper to consult a doctor. It remains to be seen whether articles in the popular press, radio doctors and research schemes combined with National Health Insurance will change the picture and fill the doctor's waiting room with migraine patients of all classes of society, perhaps with a distribution of I.Q. nearer to that of the population at large. It may be mentioned in this connection that Lewinski (7), who submitted 25 male migraine patients (presumably U.S. naval personnel) to the Wechsler test, arrived at a mean Full Scale I.Q. of 96 (σ13·8) and classified 4 patients as dull normal, and 4 as borderline cases.

From the restricted data of the present investigation it appears at any rate that migraine is not confined to people who are intellectually above average. On the other hand, the possibility cannot be dismissed that its incidence increases in the higher I.Q. ranges.

The Wechsler-Bellevue Test.

The test consists, as is well known, of a verbal part and a performance part. From the weighted scores of the 5 verbal subtests a Verbal I.Q. is obtained; from the weighted scores of the 5 performance subtests is calculated a Performance I.Q. Both together give the Full Scale I.Q. The relationship of the 10 scores to each other, the scatter, is of diagnostic value and it is from the scatter that an assessment of the patient's intellectual make-up is derived.

The migraine group will be designated as Mi, the control group as C.*

Seventeen out of the 20 Mi scored higher in the performance part of the test than in the verbal part. Thirteen in the C had done the same. The difference between Mi and C is statistically not significant and emphasizes a tendency which does not agree with the data given by Wechsler (19, p. 126) for his American population. He found that in the I.Q. range 91–110 the Verbal I.Q. prevailed slightly over the Performance I.Q. and that in the range beyond 120 it did so in the ratio of 77·4 per cent. to 21 per cent. In the absence of a large-scale standardization of the Wechsler-Bellevue scale in this country it is difficult to assess how much weight should be given to the higher Performance I.Q. obtained by 85 per cent. Mi. However, in view of the greater vulnerability of the performance part of the test shown by psychotic patients (4, 11, 16) one may maintain that the higher Performance I.Q. of Mi reveals that the group as a whole was fairly stable and not unduly disturbed. One may also infer tentatively that there was either no inclination to things verbal or a lack of experience of them, and a greater emphasis on practical aspects. In a few cases there was some evidence that the higher Performance I.Q. expressed intellectual potentialities which had not been fully developed owing to lack of educational opportunity.

Scattergrams.

The means were computed for the verbal sub-tests and the performance sub-tests and the deviations of the sub-tests from their mean were calculated. The method is described in full in the previous paper (4). The results for Mi and C are given below.

---

* The control group consisted of 10 men and 10 women. They were unselected volunteers of varied occupation and social status. They all had a stable work record and no manifest signs of physical or mental disorder.

Sum of the deviations from the individual mean score, mean for Verbal and for Performance part are calculated separately. Vocabulary and Digit Span not included in Verbal mean.

0 = + or — deviation of 1·5 or less.
+, — = deviation of 1·6 to 2·5.
++, —— = deviation of 2·6 and more.

	Group Mi.					Group C.				
	——	—	0	+	++	——	—	0	+	++
Information	0	2	17	1	0	1	2	15	2	0
Comprehension	1	0	14	3	2	0	1	14	2	3
Similarities	0	2	16	2	0	0	4	12	2	2
Arithmetic	5	3	11	1	0	7	1	9	2	1
(Vocabulary) 19 Mi	0	(2)	(12)	(3)	(2)	0	(1)	(13)	(5)	(1)
	6	7	58	7	2	8	8	50	8	6
Picture Arr.	5	1	11	2	1	4	3	12	0	1
Picture Com.	1	0	11	5	3	0	1	13	4	2
Block Design	3	1	13	2	1	1	1	13	3	2
Object Assembly	0	2	9	6	3	0	2	11	4	3
Digit Symbols	6	5	7	2	0	0	8	11	1	0
	15	9	51	17	8	5	15	60	12	8

F. ratio : Verbal : $1 \cdot 57$, d.f. 79/79, $p < \cdot 05 > \cdot 01$
Performance : $1 \cdot 49$, d.f. 99/99, $p < \cdot 05 > \cdot 01$

Distribution of Signs.

		Verbal (without Vocabulary).	Performance.	Total.
Sum 0	Mi	58	51	109
	C	50	60	110
Sum ——	Mi	6	15	21
	C	8	5	13
Sum —	Mi	7	9	16
	C	8	15	23
Sum +	Mi	7	17	24
	C	8	12	20
Sum ++	Mi	2	8	10
	C	6	8	14

The total of zero deviations is almost identical for both groups, but if Verbal and Performance parts are considered separately it appears that C showed a slightly greater scatter on the Verbal and Mi on the Performance part. Even so it will be noted that with the exception of the two performance sub-tests, Object Assembly where there is a clear plus tendency and Digit Symbols where there is a clear minus tendency, the achievements of Mi were relatively stable with at least half of the group showing no deviation from the mean.

Digit Span.

It had been found previously that the score of the Digit span tended frequently to distort the scatter picture and the Digit span was, therefore, excluded from the computation of the Verbal mean. It had further been found that the difference in the number of digits repeated forward and backward was diagnostically more important than the absolute number of digits repeated, and that it should not exceed two in favour of forward. In absolute span the Mi did slightly, but not significantly, better than the C. No significant difference was found between forward and backward as estimated by chi-square.

Picture Arrangement.

Success in this sub-test seems to be connected with social qualities rather than with intellectual abilities. Results are unpredictable. Wechsler reports (19, p. 89) that the sub-test correlates badly with the other tests of the scale, and in the writer's experience it frequently ranks last or last but one when the sub-tests are arranged in the arithmetical order of scores obtained. Minus and – – deviations are not unusual, irrespective of I.Q. The 3 plus deviations of Mi may possibly be more significant than the six minus deviations. The Mi were able to arrange the pictures so as to give a sensible story and to see the point in the story rather more frequently than usual. Many patients find the correct sequence of the pictures without a full understanding of the story.

Object Assembly.

In this sub-test a plus deviation seems to be not an unfrequent occurrence.* The test consists of three jig-saw puzzles, a manikin, a human profile and a hand. Once the effort after meaning is successful and the familiar configuration is recognized a complete failure is rare in patients other than psychotics. The abilities called forward by the sub-test are a matter of speculation, but the Mi did very well.

Altogether it seemed that in Comprehension, Picture Completion and Object Assembly the Mi had a tendency to do rather well and their achievements agreed with the ranking order of sub-tests established for the C. Sound judgement and some power of observation and discrimination are mainly needed for Comprehension and Picture Completion. In Arithmetic and Digit Span the Mi's achievements were relatively stable. These tests depend to a large extent on concentration and attention which are easily impaired by anxiety. It seems, therefore, that the majority of Mi was not unduly anxious, although difficulties in the Block Design sub-test, where item 6 was failed by 11 patients, must be ascribed to tension. Pattern 6 consists of diagonals on a square ground and thus presents incongruity between figure and ground which may, as Shapiro pointed out (17), account for difficulties. In Digit Symbols where there appeared a definite trend to do rather badly, the score was brought down through slowness. This sub-test assesses the capacity for learning and demands visual motor-co-ordination. There was some evidence that the slowness might be due partly to meticulousness and partly to a mental set-up which needed some time to warm to a new task and find the rhythm of work. The + + scatter in Vocabulary as well as the — scatter in Vocabulary and Information are indications that the Mi group was by no means uniform and contained individuals with neurotic tendencies and hysterical features.

It may be of some interest to compare the results with those obtained by Lewinski in America (7). He tested 25 male migraine patients, average age 19·6 years, mean I.Q. 96·24, and found that their best achievements were in Object Assembly, Picture Completion, Comprehension and Block Design, that results in Similarities and Digit Symbols varied, and that the performance on Picture Arrangement was inferior. The findings agree with Mi in Object Assembly, Picture Completion and Comprehension, and disagree in Block Design.

To sum up: the achievements of Mi compared well with those of C. Intellectually the majority of them seemed to function smoothly within the limits of their natural gifts.

The Rorschach Test.

The Rorschach test is one of the projective methods most widely used and it is assumed that readers are acquainted with its main aspects.

Four patients in the Mi group gave records indicating emotional lability and other features which may be called hysterical. The rigidity and negativistic attitude of two others appeared to foreshadow a probable breakdown sooner or later. A uniform personality pattern throughout the series seems, therefore, out of the question. In spite, however, of all the differences within the group, if those features of the records best suited for a quantitative comparison are inspected side by side with those of a group of duodenal ulcer patients (5)† some interesting data emerge.

The migraine group will be designated as Mi, the duodenal ulcer group as Du. The scoring of the Rorschach Research Exchange was adhered to.

---

* In the previous investigation (4) all three groups deviated towards the plus side.

† The group consisted of 16 men and 4 women, average age 42 years, the majority of which were chronic duodenal ulcer cases.

R. Number of Responses.

Total Mi 472
Du 534

	<10	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	>60
Mi	2	4	5	3	–	2	1	–	1	1	1	–
Du	4	2	3	2	3	1	2	–	1	–	–	2

Mean : Mi 23·60 Du 26·70 } $t = \cdot 5141$
SD : 14·62 21·85 } $p => \cdot 50$

The Du were more extreme than the Mi, more patients giving less than 10 or more than 59 answers. There is no hard and fast rule as to how many answers can normally be expected, but less than 10 answers are taken to denote inhibition and more than 60, unless of very good quality, to show a compulsive drive.

Considering the Mi alone: more than half of the group gave less than 20 responses. They were not very productive in spite of the relatively high level of intelligence shown in the intelligence tests.

The following figures deal with 19 patients in each group.*

P, Popular Answers.

	0	1	2	3	4	5	6	7	9
Mi	–	–	1	3	4	3	4	3	1
Du	1	2	2	3	3	5	3	–	–

Mean : Mi 5·05 Du 3·68 } $t = 2 \cdot 2592$
SD 1·78 1·83 } $p = < \cdot 05 > \cdot 02$

"Popular" answers are answers which most healthy individuals give to certain aspects of the blots. They are taken to denote in everyday life the ability to see the obvious and to think on common lines. Mi seemed better prepared than Du to accommodate themselves to reality and to trust and use their common sense. Considered in conjunction with the relatively low productivity, i.e., number of responses, one may feel that there might easily be an over-emphasis on conventional thought.

W, Whole Responses.

Percentages.

	<10	10–20	20–30	30–45	45–60	>60
Mi	1	2	4	5	6	1
Du	4	–	4	4	3	4

20–30 per cent. are considered as the norm, less than 20 per cent. as under-emphasis, more than 30 per cent. as over-emphasis. Under-emphasis on W may be due to lack of ability for synthesis or to an over-critical mind, over-emphasis on W may reveal anxiety or ambition. Du were more extreme in both directions than Mi who, though less than Du and not to such an extreme degree, tended mainly to over-emphasize the "whole" approach.

Rejections.

The patient is unable to find any answer to the card, number of cards rejected :

	1	2	3	4	5	6	7
Mi	4	3	2	–	–	–	1
Du	3	–	1	1	2	–	1

chi-square = ·1010 d.f. 1 $p > \cdot 80$

The following cards were rejected :

Rorschach Card	I	II	III	IV	V	VI	VII	VIII	IX	X
Mi	1	1	2	4	–	3	2	–	8	2
Du	–	1	3	1	3	5	4	1	4	5

---

* One patient in each group was excluded ; a patient in the Mi group who gave only 4 answers and one in the Du group who gave more than 90 and was stopped after 10 responses on several cards.

Ten Mi and 8 Du rejected from one to seven cards, the total number of rejections is 23 for Mi and 27 for Du. One Mi and 4 Du rejected more than 3 cards.

No rejection should occur in the performance of a well-adjusted individual, but Klopfer and Kelley remark (6, p. 209) that " Card IX with its complicated colour and shading effects seems to be the only card frequently rejected by normal subjects " and " rejection of Cards II, IV, VI and IX seems to be less significant than the rejection of any of the other cards."

Almost half of the patients in each group rejected one or more cards. The Du were more extreme, 4 patients rejecting more than 3 cards. Mi mainly failed Card IX (8 times) followed by Card IV (4 times) and Card VI (3 times). This accumulation of rejections shows a tendency amongst them to be easily upset by emotional stimulation or by anxiety arousing situations. Rejection of Card VI which has a sexual implication is usually taken to denote some difficulties in the sexual sphere.

Time.

Total time taken for the performance, in full minutes :

	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	>49
Mi	4	7	4	2	2	–	–	–	–	–
Du	2	4	2	5	3	–	1	1	–	1

Mean : Mi 14·63 Du 22·00 } t = 2·28
SD 6·34 12·13 } p = <·05>·02

Average time per response, in seconds:

	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	91–100	>100
Mi	2	3	6	3	2	2	1	–	–	–
Du	1	3	1	3	2	2	2	1	–	4

Mean : Mi 41·79 Du 69·89 } t = 2·1875
SD 17·04 51·80 } p <·05>·02

In view of the lower number of responses of Mi it was not surprising to find that they took less time for the performance than Du but, as the average time per response shows, they were also considerably quicker to come forward with a response. Tardiness usually denotes depression. Speed, particularly if found together with a low output and many popular answers, may indicate that the patient is not at ease and wishes " to get it over quickly."

Some more time studies were carried out, but as the method of timing had been slightly different for Du the data are only available for Mi. The highest reaction time, i.e., the time lapse between the presentation of a card and the first answer to it, occurred most frequently on Card VIII, but only in one case was the delay more than 15 seconds in excess of the average reaction time. The lowest reaction time occurred 7 times on Card V. The highest average time per response was 6 times on Card VI and the lowest 4 times on Cards I and VIII respectively. Cards X and I were viewed longest by 8 and 7 patients each, and Card V was handed back after the shortest time by 10 Mi.

The difference between the average reaction time (RT) of the 5 coloured cards and the 5 achromatic cards was in favour of the coloured cards in 14 cases. In other words the average RT was higher for the coloured cards in 14 cases and higher for the achromatic cards in 5 cases. As to the difference itself, one may hold with Klopfer and Kelley (6, p. 214) that it only becomes significant when it exceeds 10 seconds. The differences amongst the Mi patients varied from 11 seconds to 17 seconds in 5 of the 14 cases which had been slower to react to the coloured cards, and it nowhere exceeded 10 seconds where the achromatic cards had a higher RT average. There seems to be a tendency towards a longer RT on the coloured cards, but it is very slight indeed.

F, FM, m, Fc, k, K, FK,
H, A, and other content :

The two groups did not seem to show relevant differences. Fc (texture) and m (inanimate movement) were represented slightly more strongly in Mi than in Du and K (diffusion) slightly less strongly.

M, Human Movement.

	0	1	2	3	4	5	6	7	8	9	10	Total M	%
Mi	6	5	3	3	–	–	–	–	1	1	–	37	7·1
Du	6	7	2	2	–	–	1	–	–	–	1	33	6·1

chi-square = ·1131, d.f. 1, $p > ·70$

Mi were slightly more productive than Du, but the majority of Mi only produced 3 M or less, which is rather less than one would expect considering the level of intelligence. In 9 Mi cases FM exceeded M by more than 2. Six of these patients had an I.Q. above 115.

The most interesting differences between the two groups appeared, however, in their reactions to the coloured Rorschach cards.

FC, CF, C, CF>FC.

17 Mi against 10 Du gave FC answers, with the following distribution:

No. of FC	0	1	2	3	4	5	>5
Mi	2	5	5	3	2	1	1
Du	9	4	1	4	–	–	1

chi-square = 6·46, d.f. 2, $p < ·05 > ·02$

7 Mi against 11 Du gave CF answers, with the following distribution:

No. of CF	0	1	2	3	4	5	>5
Mi	12	2	2	1	–	1	1
Du	8	5	2	2	2	–	–

chi-square = ·9522, d.f. 1 $p > ·30$

One Mi against 12 Du gave C (pure colour) answers (chi-square = 8·3060, d.f. 1, $p < ·01$. Significant at ·01 level).

3 Mi against 12 Du had CF>FC (chi-square = 7·0508, d.f. 1, $p < ·01$. Significant at ·01 level).

It is generally held that FC should outnumber the CF and that there should be no C responses. It will be seen that the majority of Mi conformed to that pattern and that the majority of Du did not. The Du showed emotional lability. On the other hand, Rapaport (11) maintains that an over-emphasis on FC, particularly if there is no CF, suggests a pliable personality and lack of warmth. Four Mi, against no Du, gave 4 or more FC responses and 12 Mi had no CF. The 2 Mi who gave 5 or more CF are a timely reminder that there is no uniformity in the group.

EB, experience balance, i.e., relationship between M and the sum of the weighted colour responses, Sc.

M>sC, introversial, i
M<sC, extraversial, e
M=sC, ambiequal, a

In the following an EB of less than 2 M and sC each will be considered as constricted, an EB of 3 and more M and sC each as dilated.

	e	i	a	o	EB constricted	dilated
Mi	12	6	1	–	8	2
Du	13	4	–	2	5	–

Du's smaller number of constricted records is due to their unbalanced colour responses and this makes direct comparison with Mi difficult. Comparison apart, however, it is striking that nearly half of the Mi showed a poverty of response to movement and colour.

Last 3 Cards—Percentage and Direction of EB.

The comparison is most interesting.

The normal expectation for the last 3 coloured cards is between 30 per cent. and 40 per cent. of the total number of responses. 13 Mi against 6 Du were within that limit.

	<25%	EB	25–29%	EB	41–45%	EB	>45%	EB
Mi	1	i	2	i	2	e	1	i
Du	7	5e 1i 1ϕ	3	e	2	1i 1ϕ	1	i

Discrepancies between the direction of EB and the number of answers to the last 3 cards, i.e., over 40 per cent. with introversial EB and under 30 per cent. with extraversial EB, are taken to show difficulties in coping with the emotional life. Of the 13 Du who were outside the 30 to 40 per cent. expectation, two had an EB=0. For ten of the 11 remaining Du Experience Balance and last 3 cards—percentages were at variance. The same strong discrepancy was found by Brown and co-workers (1) in their Rorschach study on duodenal ulcer patients. In comparison, Mi showed a remarkable agreement between the last 3 cards—percentages and the direction of EB, with only one case at variance.

The ratio (FM+m) : (Fc+c+C′), another indicator of balance, was not suitable for comparison as 8 Du had a zero ratio. Amongst Mi the ratio agreed in 9 cases with the direction of the EB, showed a minor discrepancy in 5 cases, and disagreed strongly in 5 cases.

On the strength of the data presented for comparison, it would appear that Du were more seriously maladjusted than Mi.

Are Migraine Patients Obsessional?

Before attempting to summarize the Mi results independently a brief survey of Ross and McNaughton's findings (15) may be indicated. These workers reported on the Rorschach test results for a predominantly female group of 50 patients with migraine, (age 15 to 55, assessed intellectual level between high average and superior) and several control groups. They directed their attention towards "objectively defined signs." Their main findings were compared with the results of Mi, as follows:

> 1. "The migraine group tends to show delay (i.e., as defined by the authors, reaction time 20 seconds longer than the mean reaction time to all cards) on the same cards on which the psychoneurotic group fails, especially on Card VI."

The authors' inference is that there is persistence towards success in spite of difficulty and (Card VI) difficulty in sexual adjustment. Mi showed no significant delay on any specific card. If anything, 5 Mi had their longest reaction time on Card VIII. More rejections occurred amongst Mi than Ross and McNaughton's patients and the hypothesis of persistence towards success was not borne out. Card VI was rejected by 3 Mi (5 Du); 6 Mi slowed down in their reactions when exposed to that card. This may have a sexual implication, but comparative data are not convincing.

> 2. "The migraine group also has a high percentage of records in which 75 per cent. are whole responses, in which the cards are held upright as presented to the subject or in which only one response is given per card."

This is interpreted as perfectionism, inflexibility, conventionality and intolerance. Only 1 Mi had over 60 per cent. of whole responses. All Mi turned all the cards adequately with the exception of Cards V, VI, VIII and X, each of which was handed back by one patient without turning. None of the Mi limited himself strictly to one response per card.

The lack of agreement with Ross and McNaughton's findings makes it difficult to accept their conclusions to which they add that some of the features are obsessive-compulsive and "all have been found in migraine by clinical personality study."

As far as Mi is concerned, beyond the disagreement with Ross and McNaughton's findings, it would be correct to say that the Rorschach signs for an obsessional personality make-up, as listed by Rorschach, Klopfer and Kelley, and Mons (14, 6, 9) were absent or not prominent, with the exception of the comparative lack of response to movement and colour mentioned by Rorschach. This does not mean that the presence of obsessional traits can be dismissed altogether but that, if they were present, they may have showed themselves in a different way. Verbalization, for instance, was frequently over-critical. The relatively low productivity and low human movement response together with the high number of popular answers, and the frequently constricted experience balance tended to show cautiousness, adherence to conventional thought and perhaps reluctance to venture far on new ground, and these trends might easily find expression in rigidity and intolerance.

All these features, however, seem to be of secondary importance compared with the way the majority of Mi were found to handle their emotional life. If on the strength of Rorschach findings in recent research one may feel inclined to think with Plesch

(10) that emotional lability, as reflected in conflicting tendencies around the Experience Balance, is a common feature in most psycho-somatic disorders, the migraine patients of the present series were an exception. One may well ask: Why do these people with their apparently good capacity for handling their emotional life develop a migraine attack under stress? Why, if they can deal adequately with their emotional life, did 18 of them react favourably to a therapy which was entirely directed towards helping them to sort out these problems? There is no easy answer to the question. That the balance is vulnerable can be gathered from the rejections of some of the Rorschach cards. There should have been none, but half of Mi rejected one card or more. It appears that the inner balance which is well maintained under normal conditions can be considerably upset by emotionally toned or anxiety loaded situations. One may perhaps hold that the narrowness of the Experience Balance (constriction) and the emphasis on rational control (FC) and on conventional thought (" popular answers ") indicate that emotional stability is highly valued and is achieved at some costs.

Conclusions.

From the results of the tests, the patients' approach to them and their attitude within the test situation, some inferences seem possible for the majority of the group. They appeared to have a well-balanced emotional life. Rational control seemed to dominate it. They appeared to be cool, cautious people, wont to rely on their well-developed common sense, who strove to remain in control and to avoid emotional disturbances. They liked to keep their own time and rhythm. It would appear to follow that they would be very sensitive to any disturbance of their orderly emotional life as well as to interference with or upsetting of their rhythm, and would dislike all situations which threaten to get or are already out of hand. The mechanism which suggests itself would be that uncontrollable situations and/or break in rhythm would set up a tension and that this tension would be experienced as an interruption of the highly valued emotional balance. The hypothesis put forward tentatively is that tension tolerance is low and that tension itself is resented. Tension once present will, therefore, engender new tension and a vicious circle is set up which has to be broken. The migraine may have the function of resolving tension when it becomes unbearable.

Summary.

A series of 20 patients suffering from migraine were submitted to a battery of tests. The results of two Intelligence tests, Matrices and Wechsler-Bellevue scale, and of the Rorschach test were discussed. Matrices and Wechsler-Bellevue scale were found to agree reasonably well. The I.Q. distribution showed that migraine was not confined to people who are intellectually above average, but that its incidence might increase in the higher I.Q. ranges. The results of the Wechsler-Bellevue test were compared with those of a control group and it appeared that, on the whole, the migraine group functioned well intellectually. The Rorschach test results were compared with those of a group of duodenal ulcer patients. The migraine group showed itself better adjusted. No uniform personality pattern was found for the whole group. Four patients showed features which might be termed hysterical. Rorschach signs which are usually taken to denote an obsessional personality make-up were not greatly in evidence. For the majority within the migraine group the emotional life seemed to be under rational control. The main inferences were that there was a striving to remain in command of a situation and that loss of command and interference with rhythm resulted in tension which might, conceivably, be resolved in a migraine attack.

The help of Dr. T. A. Munro and Dr. D. O'Neill is here gratefully acknowledged.

BIBLIOGRAPHY.

(1) BROWN, M., BRESNAHAN, T. J., CHALKE, F. C. R., PETERS, B., POSER, E. G., TOUGAS, R. V., " Personality Factors in Duodenal Ulcer," *Psychosomatic Medicine*, 1950, **12**, 1, January–February.

(2) DAVYS, M., and O'NEILL, D., " The Therapy of Migraine " (in press).

(3) KALDEGG, A., DAVYS, M., and O'NEILL, D., " Migraine as a Stress Disorder," *Post-graduate Medical Journal*, February, 1952, **28**, No. 316.

(4) *Idem*, " The Wechsler Test in Clinical Practice," *J. Ment. Sci.*, October, 1950, **96**, 405.
(5) *Idem* and O'Neill, D., " Rorschach Pattern in Duodenal Ulcer," *ibid.*, January, 1950, **96**, 402.
(6) Klopfer, B., and Kelley, D., *The Rorschach Technique*, 1946. New York : World Book Company, Yonkers-on-Hudson.
(7) Lewinski, R. J., " The Psychometric Pattern : II. Migraine," *Psychiatric Quarterly*, 1945, **19**.
(8) *Lowenfeld Mosaics*. London : Badger Mfg. & Publishing Co., Ltd.
(9) Mons, W., *Principle and Practice of the Rorschach Personality Test*. London : Faber & Faber, Ltd.
(10) Plesch, E., " A Rorschach Study of Rosacea and Morbid Blushing," *British Journal of Medical Psychology*, September, 1951, **24**, part 3.
(11) Rapaport, D., *Diagnostic Psychological Testing*. Chicago : The Year Book Publishers Inc.
(12) Raven, J. C., *Progressive Matrices, Sets A, B, C, D and E*, 1938. London : H. K. Lewis & Co., Ltd.
(13) *Idem, Guide to the Progressive Matrices, Revised with Extended Norms*, 1950. London : H. K. Lewis & Co., Ltd.
(14) Rorschach, H., *Psychodiagnostik*. (*a*) Text-book. Bern : Hans Huber, 1941. (*b*) Cards, *ibid.*
(15) Ross, W. D., and McNaughton, F. L., " Objective Personality Studies in Migraine by Means of the Rorschach Method," *Psychosomatic Medicine*, March, 1945, **7**, 2.
(16) Schafer, R., *The Clinical Application of Psychological Tests*. New York : International Universities Press, Inc.
(17) Shapiro, M. B., " An Experimental Investigation of a Perceptual Anomaly." Paper read at the Annual Meeting of the British Psychological Society, Reading, 1950. See also *J. Ment. Sci.*, 1951, **97**, 90.
(18) *Thematic Apperception Test*. Cambridge, Mass. : Harvard University Press.
(19) Wechsler, D., *The Measurement of Adult Intelligence*, 1944. Baltimore : The Williams Wilkins Company, Baltimore.
(20) *Wechsler-Bellevue Scale, Form I*. New York : The Psychological Corporation.

THE DIAGNOSTIC SIGNIFICANCE OF CERTAIN TESTS OF CARBOHYDRATE METABOLISM IN PSYCHIATRIC PATIENTS AND THE QUESTION OF "ONEIROPHRENIA."

By W. Mayer-Gross, M.D., F.R.C.P.

(From the Department of Clinical Research, Crichton Royal, Dumfries.)

In a previous communication (1951) it was shown that the hyperglycaemic factor described by Meduna and Vaichulis (1948) in the urine of psychotics consisted of two fractions, and that the more active and specific of these was of a protein nature. Morgan and Pilgrim (1952) have prepared concentrates of this factor from the urine of male and female schizophrenics, and have produced further evidence that it is a protein or a substance strongly bound to a protein. In normal male urine they did not find a measurable quantity of the factor.

While, thus, the existence and approximate nature of the hyperglycaemic substance appeared to be established, its relation to the symptoms and diagnoses remained uncertain.

Meduna (1950) claimed that the excretion of the substance in the urine corresponds to a decreased sensitivity to insulin and the appearance of a diabetic type of reaction in the Exton Rose glucose tolerance test. He further claimed that these phenomena are characteristic of the syndrome which he described as "oneirophrenia."

Our original experiments on the nature of the urinary extracts had already shown that the excretion of the factor was not confined to "oneirophrenia" or even to schizophrenia, but that it was also excreted by other types of psychotics. In fact, in these first experiments our most consistent excretor suffered from a manic-depressive psychosis.

For this reason it was decided to subject a mixed series of patients to the three tests.

Material.

The cases were an unselected group of 50 male patients, being consecutive admissions in the admission wards of the hospital. The tests were applied before any physical treatment had been commenced. Clinical assessment was made by the physicians in charge of the respective ward independently of the chemical investigations.

Technique.

The following technique was used in the three tests. In the results the tests will be referred to by their appropriate number.

1. *The Exton Rose Glucose Tolerance Test.*

After a sample of capillary blood had been taken from the fasting patient, 50 gm. of glucose was given by mouth ; after an interval of 30 minutes another sample of capillary blood was taken and further 50 gm. of glucose were given ; a third sample of blood was taken after a further 30 minutes. The blood samples were analysed for blood glucose (King *et al.*, 1937). The test was regarded as positive if the third value was higher than the second and negative if it was the same or lower.

2. *Insulin Sensitivity Test.*

A sample of capillary blood was taken from the fasting subject and this was followed by the intravenous injection of 0·1 unit insulin per kilo body weight. Capillary blood samples were obtained at intervals of 5, 15, 25, 35, 50 and 65 minutes after the injection of the insulin. The samples were analysed for blood glucose. Depression of the blood-glucose level below 50 per cent. of the fasting level was regarded as a negative result, failure to do this as positive i.e. less sensitive.

3. *Urinary Hyperglycaemic Factor.*

24-hour specimens of urine were adjusted to pH 4·5 with acetic acid, and were then shaken with kaolin and stored overnight in the refrigerator. After further shaking on the following day the material was filtered through paper and the deposit suspended in 100 ml. 0·6 N ammonia. This suspension was shaken for 30 minutes, and then centrifuged for 15 minutes at 3,500 r.p.m. The supernatant liquid was poured into 400 ml. acetone, and the resultant precipitate concentrated by centrifugation, dried *in vacuo*, resuspended in 10 ml. distilled water and injected into the peritoneal cavity of a rabbit of approximately 2 kgm. Blood samples were taken from the rabbit before the injection and at intervals of 1, 2 and 3 hours thereafter. The blood samples were analysed for glucose, and the test was regarded as positive if after 2 or 3 hours the blood-glucose level exceeded the fasting value by 100 mgm. per 100 ml.

TABLE I.—*To show the Results of Clinical Assessment (including those classified "Oneirophrenia" {ON}) and of the Exton Rose Test* (1), *Insulin Sensitivity Test* (2) *and Test of the Excretion of the Hyperglycaemic Factor* (3)* *in an Unselected Group of* 50 *Male Psychotics.*

Case.	Clinical diagnosis.	ON.	Test 1.	Test 2.	Test 3.
1	Epilepsy	..	−	−	+ (128)
2	Schizophrenia	..	−	−	+ (130)
3	,,	..	−	−	− (29)
4	Anxiety state	+	+	+	− (15)
5	,, ,,	..	+	−	− (50)
6	Schizophrenia	..	+	+	− (15)
7	Reactive depression	..	−	+	− (15)
8	Anxiety state	..	+	−	− (21)
9	Delirium in lobar pneumonia	..	+	−	+ (167)
10	Psychopathy	..	+	−	− (32)
11	Anxiety state	..	+	−	− (20)
12	Schizophrenia	..	−	−	+ (101)
13	,,	+	−	−	− (78)
14	Epilepsy	..	−	−	+ (123)
15	Schizophrenia	+	+	−	− (19)
16	,,	+?	+	−	+ (274)
17	Psychopathy	..	−	−	− (37)
18	Schizophrenia	+	+	−	− (11)
19	,,	..	−	−	+ (163)
20	,,	..	+	−	+ (232)
21	,,	..	−	+	− (12)
22	Depression	..	+	−	− (75)
23	,,	..	+	−	+ (144)
24	Schizophrenia	+	−	−	− (72)
25	,,	..	+	−	− (0)
26	,,	+	+	−	− (69)
27	Depression	..	+	−	− (23)
28	Mania	..	+	−	− (17)
29	Anxiety state	..	+	−	− (52)
30	Psychoneurosis	..	−	−	− (12)
31	Obsessional neurosis	..	−	−	− (41)
32	Depression	..	+	+	− (82)
33	Psychopathy	..	−	−	− (0)
34	Hysteria	..	+	+	− (0)
35	Schizophrenia	..	+	−	+ (110)
36	Alcoholism	..	+	+	− (11)
37	,,	..	−	−	− (29)
38	Drug addiction	..	+	+	− (47)
39	Morphinism	..	−	−	− (11)
40	Schizophrenia	..	+	−	+ (163)
41	Depression	..	+	−	− (17)
42	Schizophrenia	..	−	−	− (60)
43	Manic-depressive illness	..	−	−	− (16)
44	Epilepsy	..	+	−	− (12)
45	Schizophrenia	..	−	+	+ (105)
46	Manic-depressive illness	..	−	−	− (46)
47	Depression	..	+	+	− (58)
48	,,	..	−	−	− (0)
49	,,	..	−	−	− (18)
50	Alcoholism	..	+	−	+ (214)

* Greatest rise in rabbit blood glucose shown in brackets.

RESULTS.

The results of the tests are set out in Table I, which also gives the greatest rise in blood glucose in test 3. Examination of this table shows that of eighteen cases of schizophrenia eight were positive in test 3. Of these one was positive to test 2 but negative to test 1. Of the remaining seven positives to test 3 none were positive to test 2 but five were positive to test 1. Of the thirty-two non-schizophrenic cases (11 depressions of the endogenous and reactive type, 5 anxiety states, 3 epileptics, 3 alcoholics, 3 psychopaths, 2 drug addicts and 1 each of delirium in pneumonia, psychoneurosis, obsessional neurosis, hysteria and mania) five gave positive results in test 3 (2 epilepsy, 1 delirium in pneumonia, 1 depression and 1 alcoholic), and of these, three gave positive results in test 1 and a fourth gave a positive result in test 2. In no single case have the results of the three tests been in agreement.

Among the thirteen cases giving positive results in test 3 only one could, perhaps, be clinically classified as "oneirophrenia," while among the group of schizophrenics negative to test 3 five patients satisfied more or less the clinical requirements of oneirophrenia as set out in Dr. Meduna's monograph. These five patients reacted negatively in test 2, and three of them were positive in test 1.

The percentage of cases positive to test 3 is much greater in those cases diagnosed as schizophrenia (8 out of 18) (44 per cent.) than in the remaining cases (5 out of 32) (15 per cent.), and the mean rise in the rabbit blood glucose is higher in this category (91 mgm. 100 ml.) than in the non-schizophrenic (48 mgm. 100 ml.). On the other hand, the mean rise in both types of case which are regarded as positive to test 3 is very similar: schizophrenic 160, non-schizophrenic 155. Similarly the mean rise of those cases regarded as negative is nearly the same: schizophrenic 37, non-schizophrenic 28 (Table II).

TABLE II.—*To Show the Maximum Rise in Rabbit Blood Glucose in Schizophrenic and Non-schizophrenic Cases Positive and Negative to Test 3.*

Schizophrenic.			Non-schizophrenic.		
Unclassified.	Positive test 3.	Negative test 3.	Unclassified.	Positive test 3.	Negative test 3.
130	130	29	128	128	15
101	101	15	167	167	50
274	274	78	123	123	15
163	163	19	144	144	27
232	232	11	214	214	32
110	110	12	15		20
163	163	72	50	Mean 155	37
105	105	0	15		75
29		69	27		23
15	Mean 160	60	32		17
78			20		52
19		Mean 37	37		12
11			75		41
12			23		82
72			17		0
0			52		0
69			12		11
60			41		29
			82		47
Mean 91			0		11
			0		17
			11		16
			29		12
			47		46
			11		58
			17		0
			16		18
			12		
			46		Mean 28
			58		
			0		
			18		
			Mean 48		

Discussion.

It is generally agreed among clinicians that the concept of schizophrenia as used in psychiatry based on certain characteristic symptoms probably comprises several disease entities of different aetiology. Attempts to break up this large grouping have been made before and have failed, but none of these attempts has been based on a combination of biochemical with clinical observations like that by Meduna.

While the clinical description of " oneirophrenia " seems sufficiently precise and well documented to allow the diagnosis and the distinction from other cases of schizophrenia, we have not been able to substantiate the claim of corresponding abnormalities of carbohydrate metabolism. If fact, there was no correlation between the three tests themselves, and between the tests and the diagnoses. The only positive finding was the incidence of the urinary hyperglycaemic factor, which occurred three times as frequently in the schizophrenic as in the non-schizophrenic group. In those cases, of both groups, in which the substance was excreted, the average amount was the same. As seen in Table I, the Exton Rose test was positive in twenty-eight cases, i.e., two to three times as frequently as test 2 and 3 ; this is in agreement with a personal communication from Dr. Meduna, in which he states that the test is so sensitive and dependent on the momentary mental state of the patient that it is useless for this purpose.

The significance of the excretion of the hyperglycaemic factor, whether as a causative agent or a secondary effect of the psychiatric condition, remains to be established.

Summary.

1. Three tests of carbohydrate metabolism,

(*a*) Exton Rose glucose tolerance test,
(*b*) insulin sensitivity test,
(*c*) excretion of a hyperglycaemic factor in the urine were applied to an unselected group of 50 male psychiatric patients.

2. No positive correlation between the results of these tests could be obtained.

3. The excretion of the urinary hyperglycaemic factor was three times more common in schizophrenics than in non-schizophrenics.

4. There was no correlation between the results of these tests and the clinical diagnoses in general. The excretion of the hyperglycaemic factor in particular was not correlated to the clinical diagnosis of " oneirophrenia."

I am pleased to acknowledge the interest which Dr. L. J. Meduna has taken in this work, and to express my thanks to Dr. P. K. McCowan, Physician-Superintendent of the Crichton Royal, for his support and critical appraisal. The biochemical work has been carried out by Mr. J. W. Walker, to whom I am very grateful and also to the physicians and nursing personnel for their willing co-operation.

REFERENCES.

King, E. J., Haslewood, G. A. D., and Delory, G. E., *Lancet*, 1937, i, 886.
Meduna, L. J. " *Oneirophrenia* " 1950. Urbana : University of Illinois Press.
Idem, personal communication, 1952.
Idem and Vaichulis, J. A., *Dis. Nerv.Syst.* 1948, **9**, No. 8.
Morgan, M. S., and Pilgrim, F. J., *Proc. Soc. Exp. Biol. and Med.*, 1952, **79**, 106.
Walker, J. W., and Mayer-Gross, W., *Brit. Journ. Exp. Path.*, 1951, **32**, 51.

GARGOYLISM (HURLER'S DISEASE).

By RONALD C. MACGILLIVRAY, M.B., F.R.F.P.S.G., D.P.M.,
Senior Registrar, Norfolk (M.D.) Group of Hospitals,
Little Plumstead Hall, Norfolk.

[Received 1 April, 1952.]

HURLER'S disease is a condition characterized essentially by mental defect, chondro-osteodystrophy, hepatosplenomegaly and corneal opacities. The complex was first noted in 1900, by John Thomson of Edinburgh who, recognizing that he was dealing with a new disease, named it after his first patient "Johnny McL—'s Disease." Subsequent descriptions were those of Hunter (1917) and Gertrud Hurler (1919).

The variety of synonyms makes difficult an estimation of the number of cases recorded, and although the disease is uncommon, by 1936 Ellis *et al.* were able to collect ten cases in the literature and add seven more personally observed.

In 1933 the era of eponymous names ended when Binswanger and Ullrich (1933) introduced the term " dysostosis multiplex " into the German literature. In this country Ellis, Sheldon and Capon (1936), because of the grotesque facies and enlarged head, suggested the colloquial description " Gargoylism," while in the United States Washington (1940) favoured " Lipochondystrophy."

Numerous other descriptions followed, so that twelve years later Strauss (1948) was able to estimate the number of recorded cases at 150, a figure with which Lindsay *et al.* (1948) agree. Since that time about a further fifty cases have been added, but the diagnosis in some of these is doubtful. It is likely that as the condition is not well recognized such patients are not infrequently misdiagnosed, while others, though diagnosed, are not recorded.

Recent reviews of the literature are those of Ellis *et al.* (1936), Henderson (1940), Lindsay *et al.* (1948), Strauss (1948), and excellent text-book pictures are those of Washington (1942), Van Creveld (1951) and Ellis (1951).

Gargoyles have been described in most European countries, in the United States and in South Africa and Australia in those of white descent. Only two instances have been found in negroes, Hubeny and Delano (1941) and Lahey *et al.* (1947). Engel (1939) has recorded the disease in Chinese patients. The condition is rather more frequent in the male and may have a familial incidence and an example of this will be described. The genetics were crystallized by Halperin and Curtis (1942), who, after factorial analysis of the reported cases, showed that a single autosomal recessive gene was responsible. In view of current theories of pathogenesis which incriminate faulty glycogen metabolism, it may be significant that a similar inheritance has been suggested by Abramson and Kuntz (1946) in von Gierke's glycogen storage disease, which likewise shows a somewhat similar histological picture.

Parental consanguinity has previously been described on only four occasions, Binswanger and Ullrich (1933), Harvey (1942), Halperin and Curtis (1942), and a fifth instance will be recorded below.

It is generally agreed that in gargoylism all the tissues of the body are the site of an abnormal storage process, and upon the nature of the substance stored depended much of the early nomenclature. The abnormal substance was at first thought to be a lipoid, and accordingly, gargoylism was included with the other lipoidoses—Gaucher's disease, Niemann-Pick's disease, Hand-Schuller-Christian's disease, and Tay-Sachs' disease—and with these eponymous names Hurler's disease fitted well as the " fifth lipoidosis." This concept that a lipoid was responsible originated with Tuthill (1934), who carried out an examination of the brain in one of Hurler's original cases. Ashby, Stewart and Watkin (1937) found changes in the ganglion cells similar to Tay-Sachs' disease, and a lipoid substance which had the staining reactions of a cerebroside ; Kressler and Aegerter (1938) likewise found considerable lipoid deposits in the tissue, and de Lange (1942) reported cells similar to those described by Ashby *et al.*, but with slightly different staining reactions. In addition, Strauss, Merliss and Reiser (1947) found in their fatal case masses of foamy cells and increased lipoid in the lymph nodes and emphasized that the main weight of the disease falls upon collagen—the fascia and ligaments—and that contraction of these is responsible for much of the deformity.

Despite the evidence, the idea of a lipochondystrophy has neither been universally accepted nor confirmed histologically. Reilly (1935) could find no lipoid in the liver and spleen of his patient at autopsy, and chemical analysis of the organs of another patient by Lahey *et al.* (1947) failed to show any increased concentration of lipoid. Indeed, the work of Lindsay *et al.* (1948) indicates that the abnormal substance is in fact a carbohydrate in combination with a protein, though unlike the majority of storage diseases this macromolecular substance is found principally not in the reticulo-endothelial system, but in the parenchyme cells themselves. About half the patients show a peculiar granulation in 60 to 90 per cent. of the neutrophil leucocytes ; these granules are large and stain dark violet with the Giemsa-Wright Technique, and are also said to consist of glycogen (Reilly, 1941). Similarly, liver biopsy may show glycogen in excess in the liver cells (Jackson, 1951).

Experimentally, Hueper (1942) has shown that macromolecular substances, notably methyl cellulose, acacia, polyvinyl alcohol and glycogen, after repeated intravenous injections are deposited in the parenchyme cells of many organs, with histological changes, which resemble those of gargoylism. Lindsay (1948) confirmed this by repeated injections of methyl cellulose into rabbits over several months, and in 3 out of 22 animals corneal opacities developed.

The cause is generally ascribed to a fault in a gene, Liebenaur (1937), Besdziek (1938) and Halperin and Curtis (1942) have demonstrated a recessive transmission. Engel (1940) attempted to explain the deformities by the theory that in early embryonic life blebs of cerebrospinal fluid escaped into the praemodial tissues. The age of onset varies, and in the majority of cases the disease is diagnosed in the first year of life ; Strauss *et al.* (1947) reported a boy who was apparently normal till his ninth year, but other patients have been diagnosed at birth (Ashby *et al.*, 1937). It has been suggested that the abnormal storage substance accumulates in the tissues, and when its quantity is sufficient it alters structure and interferes with growth. The majority of patients affected die about the tenth or twelfth year, sometimes from a respiratory infection to which the deformed thorax predisposes, or more often from cardiac failure resulting from a congenital cardiac lesion. In the 19 autopsies reviewed by Lindsay (1950) 14 patients died from the latter cause. An occasional patient lives precariously into the twenties.

There are post-mortem changes in almost all the tissues of the body, with storage of an abnormal substance. There is subcutaneous fibrosis, which produces flexion deformities of the limbs. In the long bones the zone of proliferating cartilage is narrowed, the cells vary in size and the calcified matrix is present only in traces. These changes indicate failure of cartilage growth (Washington, 1940). The anterior pituitary, liver and spleen may be enlarged. The characteristic microscopic lesions are swelling of the cells, and in some of these the perinuclear portion shows a clear vacuolated space ; other cells are coarsely or finely granular, but some nerve cells show this change in only part of the cytoplasm.

While epithelial cells and the reticulo-endothelial system are involved, mesodermal cells also show marked changes, being enlarged and vacuolated, and in the central nervous system there is an increased amount of altered collagenous intercellular substances (Lindsay, 1950). The granules in the cells have been variously claimed to be of lipoidal nature (Tuthill, 1934 ; Ashby *et al.*, 1937 ; Strauss *et al.*, 1947) or of glycogen in protein combination (Lindsay *et al.*, 1948).

On physical examination the patient is usually of short stature and may be a dwarf. The head is large and may show acrocephaly, scaphocephaly or dolichocephaly. The hair is fine and silky. Deafness is not uncommon and the ears are set low. The supraorbital ridges are prominent and the nasal bridge depressed, with a persistent purulent nasal discarge. The cheeks are ruddy, the tongue large, fissured and protruding, and the teeth widely spaced, peg-shaped and often carious. In about 75 per cent. of patients the corneae are cloudy, and slit-lamp examination shows the substantia propria to be speckled with yellow-grey refractile points of varying size. The eyes themselves are large and widely spaced, the eyelids puffy and the eyebrows and lashes are coarse.

Strabismus, ptosis, nystagmus and anisocoria may occur. Primary optic atrophy has been described and the response to mydriatics is poor. The neck is short and the head appears to sit directly on the shoulders. The thorax may show a rachitic rosary, or *trichterbrust*, and is held in the position of full inspiration. A congenital heart lesion is common. The abdomen is protuberant, often with an umbilical hernia, and the liver and spleen are enlarged. The joints of the extremities tend to take up a position of flexion and cannot be passively extended ; deformities such as genu valgum, talipes and pes cavus are often found and a kyphosis in the upper lumbar region is usual. Occasionally there is evidence of a pyramidal lesion.

Hirsuties may occur on the face and back and the skin is dry, waxy and thickened. W.R. is negative.

The blood may show a hypochromic microcytic anaemia and a relative lymphocytosis and characteristic granules in the neutrophils have been described (Reilly, 1941). Similar cells have been found in the spleen and bone-marrow. The blood cholesterol is occasionally raised and liver function tests have sometimes shown impairment. Reducing substances have never been found in the urine. X-ray examination in a typical case shows a large, shallow sella turcica without clinoid erosion, an upper lumbar kyphosis with deformity of the anterior part of the vertebral bodies producing a hook-like process, an increased transverse diameter of long bones and demineralization in the ossific centres for the femoral and humeral heads, poorly formed acetabular and glenoid fossae, and epiphyses which are irregular and appear late.

The mental changes have attracted attention since the earliest descriptions of the condition, and the majority of patients have followed Hurler's (1919) original two cases and shown some degree of mental defect. On a number of occasions however the patient has appeared to be of normal intelligence (Hunter, 1917 ; Nonne, 1924 ; Cockayne, 1935, 1936 ; Liebenaur, 1937 ; Orr-Ewing cited by Ashby *et al.*, 1937 ; Henderson and Ellis, 1940 ; Reilly and Lindsay, 1948 ; Channarond, 1950 ; Jackson, 1951). A smaller group have intelligence which has been described as being above average. In the majority of these no formal testing was performed and the assessment of mental capacity was mainly descriptive ; thus, Nonne (1924) recorded three sisters " who were among the best in school "; Helmholtz and Harrington (1931) described a patient as being " mentally alert," and there are others : Liebenaur (1937), Ashby *et al.* (1937), Engel (1939), Meyer and Okner (1939), Hubeney and Delano (1941), Harvey (1942). One of the most interesting is the case of Strauss *et al.* (1947), who was "an outstanding student at high school, an intelligent and voracious reader, an intense lover of music ; he played chess and gained recognition locally as an outstanding player."

As might reasonably be expected, histological changes at autopsy have been found to vary with the presence or absence of mental defect. Reilly and Lindsay (1948) showed in a gargoyle of normal intelligence that storage of the macromolecular substance occurred in only the connective cells of the brain, while in patients with retarded mental growth there were deposits in all the cells of the central and peripheral nervous system.

Cockayne (1936) postulated that when the physical deformities were less severe, mental defect was similarly less marked, but a review of the reported cases does little to confirm this. A much more important feature is the marked mental deterioration which was noted by Ellis (1936) in his early cases, but which has received scanty prominence and which will be emphasized further in the illustrative cases about to be described.

Differential diagnosis is usually easy, and gargoyles—like mongols—resemble each other far more closely than other members of their own family. However, congenital syphilis may give rise to difficulty, but here the W.R. is positive, the corneal changes are different and there is a good response to antisyphilitic treatment. In cretinism the corneae are normal, hepatosplenomegaly is rare and thyroid administration gives good results. Hypertelorism has no changes in the long bones, and neither corneal opacities nor splenomegaly. Rickets is unlikely to cause confusion. In Morquio's disease the spine is heavily involved and the skull usually escapes, though the nasal bridge may be depressed. Corneal opacities, mental defect and evidence of abnormal storage are absent and the radiological appearances are helpful, being chiefly metaphyseal in Morquio's disease and epiphyseal in gargoylism. Intermediate forms have been described, and splenic or hepatic puncture may be useful in diagnosis.

The incomplete forms of gargoylism have been considered in detail by Jervis (1950), but the clinical criteria of even the gross case are doubtful. Strauss *et al.* (1947) divide the signs into two groups, the first being constant and the second significant, but not constant. The former group includes dwarfism, large head, flexion deformities and a protuberant abdomen, and the latter mental retardation, corneal clouding, hepatosplenomegaly, umbilical hernia and bony changes. However, there is little general agreement among the different authorities. Corneal opacities were regarded as an essential feature by the early writers (Helmholtz and Harrington, 1931), yet generally the features emphasised by Ellis and his co-workers in 1936 remain adequate, i.e., mental deficiency, corneal opacities, hepatosplenomegaly, chondro-osteodystrophy and grotesque facies, but with the provision that one or rarely more than one of these may be absent. The diagnosis of "gargoylism" has been made in patients who have shown neither mental defect nor physical deformity, being based purely upon the X-ray evidence (Channarond, 1950)—a practice which is contrary to the original concepts of the condition and which brings the term into disrepute.

Five illustrative cases will now be described :

Case 1.

Margaret C—. Female born 17.ix.45. An only child whose parents were married for five years before conception. The mother's age at birth of the child was thirty years. Pregnancy was uneventful, but labour was difficult, and forceps were required. The patient weighed 6¾ lb. at birth and was breast-fed until 5½ months. The parents are unrelated, and there is no family history of mental disease apart from a maternal uncle who has been a voluntary patient in a mental hospital since 1939 suffering from a depressive illness. The father is a picture-framer by trade, and considered that the child was unduly ugly from the age of two months.

In 1950 she was referred to a Child Guidance Clinic because of mental retardation ; a diagnosis of gargoylism was made and she was admitted to a mental deficiency hospital. She was unable to dress or undress herself ; she was incontinent and could not speak ; she was able to walk a few steps and made climbing movements in her cot. Physically she weighed 2 st. 3 lb. and had a height of 2 ft. 9 in. She evidenced most of the stigmata of gargoylism : thus, the head was large, the biparietal diameter was 14 cm. and the occipitofrontal 20 cm. but the hair was unusually coarse. The nasal bridge was depressed and the supra-orbital ridges prominent. The teeth were carious and the tongue large, fissured and protruding. The corneae shows marked opacities. The neck was short, she was slightly breathless and there was a soft mitral systolic murmur. The abdomen was protuberant, with a small umbilical hernia ; the liver was three finger-breadths enlarged and the lower pole of the spleen just palpable. There was a persistent thick purulent nasal discharge and slight deafness. The fingers were stubby and flexed and there was a considerable lumbar kyphosis. An X-ray of the skull showed the typical long, shallow pituitary fossa. There was no abnormality in her nervous system. W.R. was negative and the urine normal.

In 1951 she developed lobar pneumonia and this recurred early in 1952. Her physical state has deteriorated steadily, deafness becoming more pronounced and the corneal opacities increasing in size. Biochemical investigations are normal, apart from an increased sugar tolerance with a flat blood-sugar curve. The blood shows a mild hypochromic anaemia and numbers of the neutrophils contain purple-black granules—some basophil and some acidophil. An E.E.G. gives a grossly abnormal but unspecific record. The eyes are more like adult eyes in size. The conjunctival vessels are injected, with a corneal haze. The corneal microscope shows numerous dot-like opacities in the substantia propria which resemble snowflakes and are evenly distributed throughout the tissues. The pupils are moderately dilated and react sluggishly to light.

The level of her intelligence is too low for the application of a standard test, but some estimate can be obtained from Gesell's norms and the Vineland scale. In the former she passes the majority of the requirements of the 6-month level—following a moving light with her eyes, lifting a paper placed over her face and sitting up alone, etc. At the 9-month level she showed some response to the mirror image of herself and sits satisfactorily. Her speech is *nil*. She passed none of the criteria of the 12 and 18-month levels. She passes approximately 80 per cent. of the criteria on the Vineland Social Maturity scale at the 0 to 2-year level. She has never imitated sounds, but she used to draw herself upright and walked alone about the age of 2½ years. At the 1- to 2-year level she fulfils none of the requirements, apart from eating with a spoon, and this not without making a mess. Formerly, she walked unattended, marked with a pencil and drank with a cup almost by herself. She would therefore seem to have had about 15 to 20 per cent. of the requirements of this level. Her mental development at present seems to be about the 9- to 10-month level, but it is difficult to make an accurate estimate while she is chronically sick and confined to bed, especially with regard to walking.

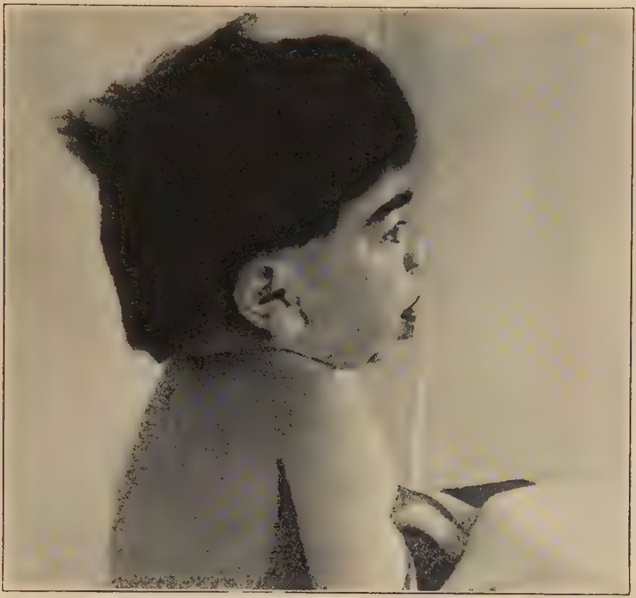


FIG. 1.

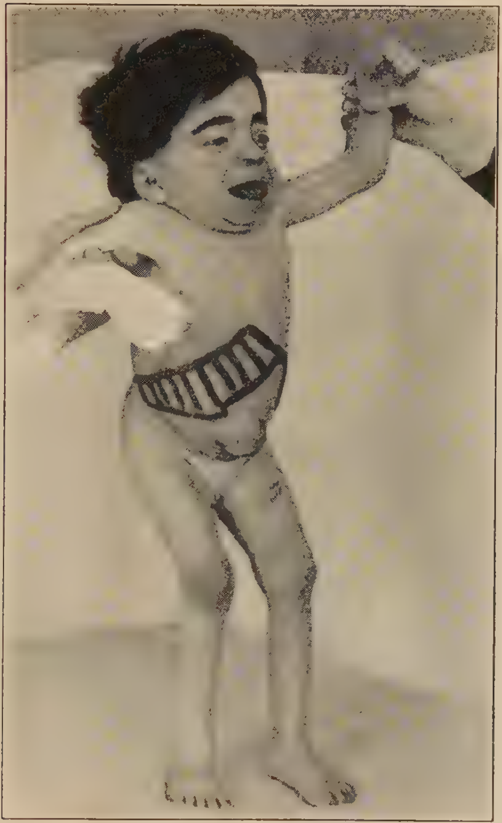


FIG. 2.

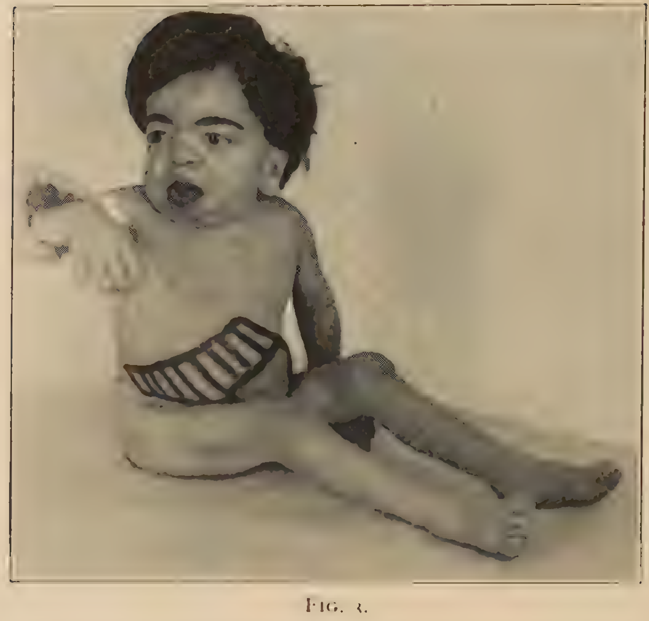


FIG. 3.

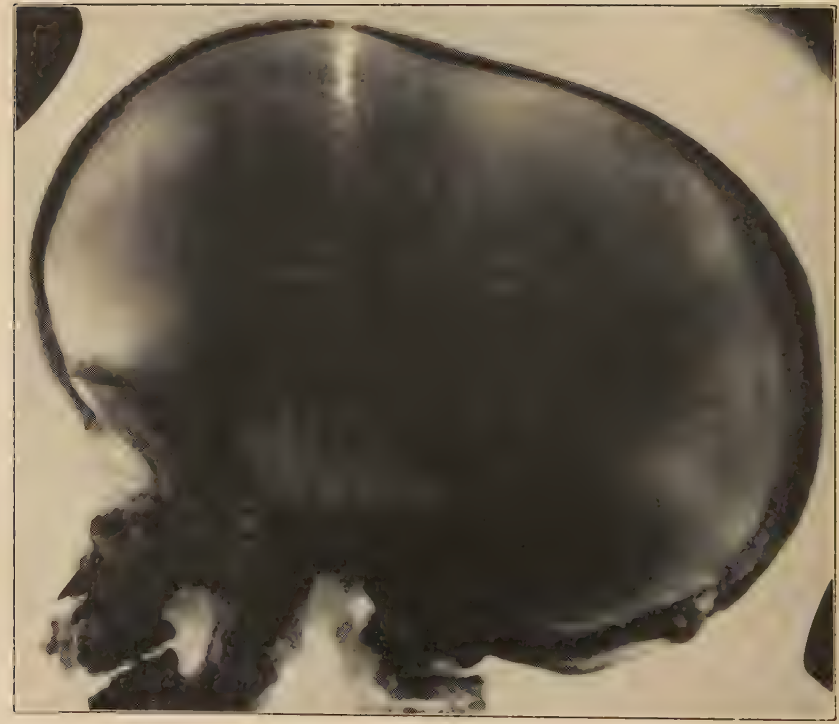


FIG. 4.

Reports do not suggest that much deterioration has so far taken place. Her speech is absent as formerly. Her walking is not evident at present but it is premature to say that the skill is lost. Her milestones were late—she walked at 2½ years and only started climbing at 5 years. Her development never appears to have been much beyond the 12-months level. However, her fine muscular control is not now so good as formerly. She could previously mark with a pencil, turn a door-knob and pull off her boots, but how far lack of opportunity for practice during the past year accounts for this deterioration is a matter for conjecture. It may well be inaccurate to measure her development in comparison with a normal child because her deafness has been a handicap to general social progress as well as to the acquisition of speech, yet in the circumstances it is difficult to do otherwise.

Case 2.

Maurice D—. Male born 28.v.43. An only child whose parents were ten years married before the child was born. There is a history of gargoylism on the mother's side, and one of the first features noted on entering the home was an early photograph of the mother nursing a younger gargoyle brother. The maternal grandmother is said to have had two brothers of grotesque appearance who died at an early age, and the mother herself had two younger brothers whose photographs were typical of gargoylism. One of these died at the age of 3½ years and the other died aged 6 years. A maternal aunt gave birth to a similar male child who died at the age of 10 years. It was in fact a family tradition that the eldest daughter produced such male children, this being the case in the patient's grandmother, mother and mother's aunt. A maternal uncle and aunt have normal children, and on the father's side there is no family history of mental or nervous disease with the exception of one paternal uncle who is described as "dull." The parents are not related.

Pregnancy was uneventful, but labour was difficult, the child being two weeks post-mature, forceps were necessary and the child was said to have been jaundiced and the vernix golden. He was breast-fed, but never hungry, and cried day and night. Maurice passed the usual milestones early, having bladder control at one year and taking a few steps at that time. His mother had, however, noticed that he had a lumbar kyphosis at the age of 9 months, and photographs show increasing facial stigmata from the age of 6 months. In 1946 he had an operation for umbilical hernia, and in 1947 a diagnosis of cretinism was made and he received treatment with thyroid extract. At the age of 5 years he spoke in simple sentences, obeyed simple commands and did small messages for his father, who is a gardener. He was fond of music.

At 6 years a Terman Merrill Form L, however, gave him a mental age of $2\frac{8}{12}$ and an I.Q. of 42. By 1950 the patient had lost all interest in his surroundings and was restless, noisy, destructive and incontinent of urine and faeces, and in 1951 he had a transient episode of flaccid paraplegia. Now (1952) his head is large with an occipito-frontal diameter of 16 cm. and a biparietal diameter of 14 cm. His nose is depressed. The optic discs are on the pale side of normal.

He has a marked kyphosis; the arms are held in a position of flexion and cannot be extended; he has knock-knees, pes cavus and brittle nails with small ulcers on the fingers. There is a harsh systolic murmur over the praecordium, and attacks of dyspnoea at night are frequent. The abdomen is protuberant and the liver two finger-breadths enlarged. Blood-films failed to show any of the characteristic abnormal cells.

As regards his mental state; attention and comprehension were insufficient to pass any of the Revised Stanford-Binet Intelligence Scale tests at the 2-year level. He understands only a few very simple commands such as "Come here." His speech is very indistinct and now rare. His habits fulfil all the requirements of the Vineland Social Maturity scale at the 0–1-year level, and about 25 per cent. of the 1–2 stage. Maurice walks about the room unattended, drinks from a cup with assistance, scribbles with a pencil, etc. According to Gesell's norms, he is about the 12–18-months level. He opens a door, walks alone, and puts a cube in a cup after much persuasion. He cannot indicate any part of his body. From these criteria the level of his development would seem to be about 15–18 months and his I.Q. therefore below 30. Considerable deterioration would appear to have taken place, because at one stage he could eat from a spoon, draw a circle or cross, say nursery rhymes, count up to ten, drink unassisted, build blocks instead of flinging them to the floor as he now does, and walk upstairs alone. It is difficult to estimate his previous mental level without accurate knowledge of the time when the various skills were accomplished, but to be able to draw a circle and say nursery rhymes, etc., he would seem to have had a mental age of 3–4 years at one point; certainly in 1949 it was $2\frac{8}{12}$ as contrasted with that of 15–18 months which he now shows.

Case 3.

Beryl G—. Female born on 20.xii.41. A paternal uncle was epileptic, and a paternal aunt died in a mental deficiency hospital in 1940 from cerebral diplegia. The parents were cousins and the father's surname is the same as that of the mother in Case 1, but no relationship can be traced. The mother's age at birth of the child was 20 years, and the patient has two brothers older and one younger than herself, all of whom are normal. Pregnancy was uneventful and the labour was normal. The patient weighed 7½ lb. at birth and was breast fed. She was seldom hungry and was breathless and snuffly. She had control of her bowels at one year. By the age of two years it was apparent that she was definitely abnormal and she was taken by her mother to a general hospital. At that time she made no attempt to walk, the abdomen was protuberant, and a diagnosis of cretinism being made she received treatment with thyroid extract. She had bladder control at three years and commenced to walk about the same time. By 1947 her head was enlarged, there was a pigeon chest and an umbilical hernia. A Terman Merrill Form L gave a mental age of $3\frac{11}{12}$ and an I.Q. of 66. A year later her height was 2 ft. 9 in., she shuffled along with her knees bent and on her toes. She could feed herself and undress, but not dress. She could count up to ten in a husky voice, carry out simple commands and could write the alphabet. A Terman Merrill Form L test now gave a mental age of $4\frac{10}{12}$ and an I.Q. of 70.

Her physical state (1952) shows a large head with an occipito-frontal diameter of 18 cm. and a biparietal of 14 cm. The supra-orbital ridges are prominent, the tongue protrudes and the voice is whispered. She is left-handed. The limbs are held in a position of flexion and the short neck in extension. The liver is five finger-breadths enlarged. There are marked hirsuties on the back and brown pigmentation of the trunk and limbs. Blood films show numbers of the neutrophils to contain purple-black granules. The pupils react to light, and there are no corneal opactities. Her eyesight is, however, failing rapidly and the retinal vessels are described as tortuous. Her physical disabilities—inadequate sight, poor muscular flexibility in drawing and husky voice—are now so pronounced that no full-scale standard intelligence test can be applied. On the Terman Merrill Scale Form L her performance indicates roughly a mental age of 5 to 6 years with an I.Q. of 50–60. The Goodenough rating of a drawing of a man suggests a mental age of 5 years. Her general knowledge appears to be superior to her present functional level. She knows her birthday, age, the number of pennies in a shilling and can name the days of the week. Although her arithmetic book contains subtraction sums, she fails to give the change of 5*d.* from 1*s.* or of 10*d.* from 2*s.* She repeats five digits forwards but only two reversed. Her vocabulary and comprehension would seem to be the brightest aspects of her intelligence and least handicapped by her physical deterioration, but even those would seem more impaired now than three years ago when she was last tested. Neither of these abilities could be rated at the 7-year level, and it would appear that an I.Q. of 70 as previously obtained is now beyond her power.

Her general social maturity has also grossly deteriorated with her physical disabilities. The degree of her physical and sensory deterioration makes the field very limited for testing the extent of her intellectual deterioration, which would, however, also seem to have taken place. She died in March, 1952, from bronchopneumonia. Autopsy was refused.

Case 4.

Diane H—. This girl was born on 22.vii.42 during an air raid. A paternal uncle and a maternal aunt were epileptic. The father was aged 28 and the mother 26 years, and were not related. She was an only child; labour was normal and she was bottle-fed. At the age of 9 months she was seriously ill with pneumonia and about that age began to say "Dada." She is said to have appeared normal apart from a severe kyphosis of the lumbar spine which was first observed at this age. By 2 years the head was large, the eyelids puffy and the nose flat. A diagnosis of mongolism was made. She could, however, walk alone. Her weight was 2 st. 4 lb. and her height 2 ft. 6 in. The W.R. was negative, and although an X-ray of the lumbar spine showed notching of the anterior parts of the vertebral bodies of L2.3.4, the diagnosis was now changed to cretinism and she was treated with thyroid extract.

By the age of 4 years she could control her bowels but not her bladder. The liver and spleen were enlarged; there was hirsuties on the face; the corneae were cloudy and polydipsia marked. She could speak a few words such as "all done" or "quack quack." She was walking well and still on thyroid gr. 3 daily.

At 5 years of age she developed an umbilical abscess and at 6 years otitis media. She had repeated attacks of bronchitis. She now walked stiffly and extension of the limb-joints was limited.

The Terman Merrill gave a mental age of less than 3 years and an I.Q. of under 40. By 1949 she was unable to walk, speech had disappeared and she was doubly incontinent. She was completely blind and could do nothing for herself. She died in 1950 from lobar pneumonia at the age of 8 years.

Case 5.

John W—. An only child born on 4.iv.42. His father suffered from diabetes mellitus and failing eyesight. Labour was uneventful, but the infant was abnormal at birth. The head was large and the corneae were cloudy with internal strabismus. The abdomen was protuberant and a large umbilical hernia was prominent. The nasal bridge was depressed, breathlessness was pronounced and there was a harsh systolic murmur all over the praecordium. He was described as "a typical achondroplasic dwarf." Bladder control was established at 18 months; he could walk a few steps at 2 years and speak a few words at 2½ years. In 1948 he commenced attending an occupation centre, but his mental condition deteriorated and he became incontinent, unco-operative and difficult to handle. By 1950 he had become very deaf and could only say words and short sentences. He knew the primary colours and where his home was situated. He fed himself clumsily with a spoon and played with a tricycle. In May of that year, on the Terman Merrill Scale Form L his mental age was 3 years and his I.Q. 37. He suffered from repeated attacks of bronchitis, and died early in 1951 from broncho-pneumonia at the age of 9 years.

SUMMARY.

A brief review of the literature on gargoylism is given and five further cases are reported. The characteristic granulation of the neutrophils described by Reilly (1941) was confirmed in two out of three patients investigated from this aspect. Waarenburg's (1940) assertion that complete blindness never occurs cannot be sustained, as Case 4 went on to this state. Although Helmholtz and Harrington (1931) claim that thyroid extract improved one of their cases, no similar benefit resulted from prolonged thyroid medication in these five patients, but its value as a therapeutic test in the differential diagnosis of cretinism has been mentioned above. No other treatment is known apart from palliative orthopaedic measures for the deformities.

It is suggested that gargoylism is more common than is indicated by the number of reported cases, and that the condition is not infrequently misdiagnosed—of the five patients described two were considered to be cretins, one a mongolian imbecile and one an achondroplasic dwarf.

As well as describing the progressive physical impairment, an attempt has been made to emphasize the mental deterioration which may also occur. This was definite in four patients and may yet appear in the fifth and youngest, where its existence is at present doubtful. That mental deterioration exists is not widely appreciated, and as no mention of the intellectual progress of the patient is made in many of the reported cases, it is impossible to assess the percentage of patients in the literature where such deterioration has in fact taken place. Ellis (1951) speaks of " a rapid regression during later infancy in some cases " and while valid conclusions cannot be drawn from so small a series, the incidence of mental deterioration was striking and is of obvious importance in prognosis.

I have to thank Professor R. W. B. Ellis for his advice, Dr. W. E. Rutledge for the ophthalmological reports, Dr. V. F. Fennell for the E.E.G. report, Dr. B. M. Maxwell for the X rays, Dr. A. L. M. Christie and Mr. F. H. Hughes for pathological investigations, and Miss Constance Mathieson for psychometric assessments. To Dr. J. V. Morris my special thanks are due for his continued help and encouragement.

BIBLIOGRAPHY.

ABRAMSON, H., and KUNTZ, L. D., *Amer. J. Dis. Child.*, 1946, **72**, 510.
ASHBY, W. R., STEWART, R. M., and WATKIN, J. H., *Brain*, 1937, **60**, 149.
BESDZIEK, L., *Monatschr. f. Kinderh.*, 1938, **76**, 305.
BINSWANGER, E., and ULLRICH, O., *Ztschr. f. Kinderh.*, 1933, **54**, 699.
CHANNAROND, *Arch. franc. pédiat.*, 1950, **7**, 544.
COCKAYNE, E. A., *Proc. Roy. Soc. Med.*, 1935, **28**, 1067.
Idem, ibid., 1936, **30**, 104.
DE LANGE, C., cited by de Lange and others, 1944, *Acta. paediat.*, 1942, **31**, 398.
ELLIS, R. W. B., *Brit. Encyclopaed. Med. Pract.*, 1951, **5**, 640.
Idem, SHELDON, W., and CAPON, N. B., *Quart. J. Med.*, 1936 **5**, 119.
ENGEL, D., *Arch. Dis. Childh.*, 1939, **14**, 217.
Idem, Amer. J. Dis. Child., 1940, **60**, 562.
HALPERIN, S. L., and CURTIS, G. M., *Amer. J. Mental Def.*, 1942, **46**, 298.
HARVEY, R. M., *Amer. J. Roentgenol.*, 1942, **48**, 732.
HELMHOLTZ, H. F., and HARRINGTON, E. R., *Amer. J. Dis. Child.*, 1931, **41**, 793.
HENDERSON, J. L., and ELLIS, E. W. B., *Arch. Dis. Childh.*, 1940, **15**, 201.
HUBENY, M. J., and DELANO, R. J., *Am. J. Roentgenol.*, 1941, **46**, 336.
HUEPER, W. C., *Arch. Path.*, 1942, **33**, 267.
HUNTER, C., *Proc. Roy. Soc. Med.*, 1917, **10**, 104.
HURLER, GERTRUD, *Ztschr. f. Kinderh.*, 1919, **24**, 220.
JACKSON, W. P. U., *S. Afr. Med. J.*, 1951, **25**, 385.
JERVIS, G. A., *Arch. Neurol. Psychiat.*, 1950, **63**, 681.
KRESSLER, R. J., and AEGERTER, E. E., *J. Pediat.*, 1938, **12**, 579.
LAHEY, M. E., LOMAS, R. D., and WORTH, T. C., *ibid.*, 1947, **31**, 220.

Liebenaur, L., *Ztschr. f. Kinderh.*, 1937, **59**, 91.
Lindsay, S., *Brit. Heart. J.*, 1950, **12**, 17.
Idem, Reilly, E. A., Gotham, T. J., and Skahen, R., *Amer. J. Dis. Child*, 1948, **76**, 239.
Meyer, S. D., and Okner, H. B., *Am. J. Ophth.*, 1939, **22**, 713.
Nonne, M., *Dtsch. Z. Nervenheilk*, 1924, **83**, 263.
Reilly, W. A., *Endocrinology*, 1935, **19**, 639.
Idem, *Amer. J. Dis. Child.*, 1941, **62**, 489.
Idem, and Lindsay, S., *ibid.*, 1948, **75**, 595.
Straus, R., Merliss, R., and Reiser, R., *Amer. J. clin. Path.*, 1947, **17**, 671.
Strauss, L., *Amer. J. Path.*, 1948, **24**, 855.
Tuthill, C. R., *Arch. Neurol. Psychiat.*, 1934, **32**, 198.
Van Creveld, S., in Parson's L., *Modern Trends in Paediatrics*, 1951. Butterworth.
Waarenburg, P. J., *Ophthalmologica*, 1940, **99**, 307.
Washington, J. A., in Brennemann, J., *Practice of Paediatrics*, 1940. Hagerstown, Md.: W. R. Prior & Co.

RORSCHACH VALIDATION. I: A RATIONALE.

By J. D. Keehn.

London University Postgraduate Scholar at Institute of Psychiatry, Maudsley Hospital.

The Rorschach ink-blot test is so well known amongst present-day psychologists that any attempt to describe its composition and the aims and ambitions of its protagonists would be presumptuous. However, the underlying assumptions involved in the use of the test are neither so widely understood nor so universally accepted. It is for this reason that there have been so many and so various attempts to establish the validity of the Rorschach.

The vast amount of clinical material offered in support of Rorschach's original hypotheses has already been summarized by Hertz (1942) and by Bell (1948), and is growing constantly. So much material is available that it is almost impossible for any single worker to obtain a complete and comprehensive acquaintance with it. This fact in itself would seem to offer a *prima facie* case in support of the justification of the continued use of the Rorschach and interpretations from it, for in all this wealth of material hardly a dissenting word can be found.

In her historical summing up of validating procedures used in the Rorschach, Hertz (1941) draws attention to the initial rather chaotic introduction of the Rorschach, and the great advances which have arisen out of the publication of the various norms and standardization tables available in the major text-books on the subject. The actual use of the norms in the differential diagnoses between various clinical groups obtainable by the use of the Rorschach furnishes a good deal of the material appearing in Bell's bibliography (1948) mentioned above.

However, both Hertz (1941) and Cronbach (1949) have drawn attention to the statistical inadequacies of many of these studies, insufficient numbers of cases, tending often to highly selected samples, frequent misuse of statistical devices and misinterpretations of the results being the most common pitfalls. Cronbach (1949), for instance, points out at some length that many authors have accepted occasional significant " t " ratios between various groups at their face value, instead of taking into account the number of significant ratios that could arise by chance alone in that particular study. Welcome attention to this point has recently been paid by Meyer (1951), who, obtaining one significant ratio in twelve, instead of pointing to this as psychologically important, recognized that this could be just a chance occurrence.

Inattention to statistical and experimental procedures is not surprising when one remembers that the Rorschach has been mainly used by practical clinicians. The demands of experimental rigour have always in the clinic been secondary to those of clinical expediency. Remembering, too, that the clinician can take no account of adequate selection principles but must take his cases as they come, one can see how easy it is for him to build up a biased view, a bias that will later affect his own interpretations. Adding to this the further natural tendency only to write up and report successful cases, and to disregard those not fulfilling expectations, it is possible to see how gradually and insidiously an erroneous picture could be built up. In order, then, to decide whether the present Rorschach picture is an erroneous one or is in fact fully justified, one must turn to an examination of the more deliberately experimental attacks upon the problem.

The variety of techniques available for studying the validity of psychological tests has been previously classified by several writers—Sargent (1945), Hertz (1941), McFarlane (1942), and Ainsworth (1951). Extracting from these studies the following major categories,

1. Correspondence with other criteria,
2. Predictive success,
3. Experimental modification,
4. Internal consistency,

let us examine some of the typical studies included in them and consider why such studies should have arisen.

One of the earliest and, on the surface, most obvious ways of testing the validity of a holistic test such as the Rorschach is known as the matching method. Devised and quantified by Vernon (1936), this type of study whereby Rorschach records are matched with case-history notes by impartial and independent judges enjoyed a great deal of success, studies by Vernon (1935*b*), Krugman (1942), Troup (1938) and Munroe (1942) giving contingency coefficients in the region of ·8. However, more recently the value of this method has been brought into question.

Firstly, general acceptance is accorded to the point that even small and specific mannerisms appearing on a test record could, in the hands of skilled judges, be sufficient to form the basis of a correct match. For instance, difference in language, both of content and expression, could enable almost anyone to say which of two records was that of a normal university graduate and that of a builder's labourer. As these external facts would appear on the case-notes it is clear that matching could be done quite independently of the more relevant Rorschach indices. Were very large numbers of pairs matched simultaneously, it might be argued that these external clues could only play a very minor role, but as, on the average, the judge has only five protocols and sets of notes to match at any one time, this point cannot so easily be explained away. Further, even without the help of extra-test cues, such degree of agreement would depend largely upon the sample chosen, for unless the cases were selected entirely at random there might be a very natural tendency to include only those cases exhibiting so-called typical Rorschach protocols, with the natural result that any judge aware of the expected signs will achieve a high degree of correct matching.

There are other objections to this method, notably the range of skill of the judges themselves, which would enable some judges to make more use of the relevant clues than others, and the unreliability of the case-notes as pointed out by McFarlane (1942). Both these objections fall into a rather different class from the first ones mentioned, for whereas they could explain the superficially high degree of correct matching in the hands of competent judges, these would tend to produce the opposite. Were all unskilled judges used it would be expected that the degree of matching would fall to chance level if they ignored the protocols altogether, or less if some other personal, irrelevant criteria were introduced. Similarly, if the case-notes are unreliable, no better than chance matching would be expected. Thus the degree of agreement between Rorschach protocols and case-histories could range from almost complete agreement to wellnigh complete disagreement due to these variables alone. So the method is unreliable as well as invalid.

A variation of this technique is that usually attributed to Rosenzweig (1935). Generally known as the method of blind analysis, it is based upon direct comparison between Rorschach test protocols and clinical findings. In principle the subject is clinically examined by one investigator and given the Rorschach by a second. This Rorschach protocol is then scored and interpreted by yet a third investigator who had previously had no contact with the subject.

The study by Benjamin and Ebaugh (1938) may be cited as an example of this technique. They used 46 patients who were clinically examined by one author and tested on the Rorschach by the other. However, the following quotation from their paper admits of a very serious deviation :

> "in 34 . . . cases included in the validatory series proper, the test was administered personally by the interpreter. Although no remarks were exchanged beyond the usual brief instructions and subsequent review of answers, it was, of course, possible to receive diagnostic impressions which may, in turn, have influenced the interpretations."

In other words, they recognize the possibility that they may have ruined the design of the experiment and really only correlated together two sets of clinical opinions, the Rorschach test being used solely as a method of " interview " by one of the clinicians.

Of the remaining 12 patients with whom the experiment was conducted properly and whose protocols were interpreted " blind," they claim *complete agreement* between the interpretation and final clinical diagnosis in all but one. However, it must be remembered that by " complete agreement " is meant simply that the authors express satisfaction that the words used in one description have the same meaning as those used in the other. That such satisfaction would be evinced by other observers cannot, of course, be guaranteed. This point must be borne in mind when evaluating all of these studies.

In an addendum to this article Piotrowski makes the point that the Rorschach is primarily a test for obtaining personality descriptions, and is not meant to be used in lieu of a diagnosis—a point more recently made by Ross (1950). Piotrowski (1938) goes on to argue that as the validity of a diagnosis would necessarily be lower than that of a description, the diagnosis being made on the basis of the description, then taking the Rorschach for what it is meant to be, it gives an even more valid personality description than the results of Benjamin and Ebaugh suggest.

Further similar studies on single cases were carried out by Miale, Clapp and Kaplan (1938) and by Piotrowski (1937–8). Qualitative comparisons of interview and test interpretations showed fairly high degrees of agreement, and the authors expressed their confidence in the validity of the test. Using the same technique, Brussel and Hitch (1942) reported essential agreement between Rorschach and clinical interviews in 98 per cent. of their 50 cases. Michael and Buhler (1945), using cases said to be more difficult to diagnose, obtained 70 per cent. agreement, and the same degree of agreement was obtained by Garfield (1947), who also used cases which had proved difficult to diagnose.

However, in many of these cases the authors frankly admit that diagnoses were made with the aid of the Rorschach protocols, Garfield (1947) even pointing to this as favourable to the Rorschach in that it must have had support from outside sources. Again, investigators were not always careful to ensure that contact between patient and interpreter was avoided, thus introducing yet another source of error. In the studies where these factors had been adequately controlled the number of cases have been too few to allow of important generalizations.

In all these instances the infallibility of the psychiatric diagnosis is implicit. Even where such unreliability is recognized, it is explained away as being a combined staff decision and so, presumably, reliable, Garfield (1947), but Ash (1949) has emphasized the danger of using this criterion by showing the surprisingly low degree of agreement between psychiatrists even when patients are jointly interviewed, thus giving each psychiatrist the benefit of questions asked by his colleagues.

To add to the confusion a rather different technique, concerned more with the reliability than the validity of the test has also been labelled " blind analysis." This, instead of being concerned with matching protocols and case-histories, is used to investigate the interpretations by different workers of the same protocol. One such study by Hertz and Rubenstein (1939) cites interpretations by Hertz, Beck and Klopfer as being almost identical in the case of a single subject. That such agreement must necessarily obtain for any test to be of value is too obvious to warrant discussion here. Such agreement is not always the case with Rorschach interpretations, but this is only a practical drawback and may conceivably be overcome with care, experience, and objectification.

Many writers nowadays, Hertz (1943), McFarlane (1942), Sargent (1945), Ainsworth (1951), point to the value of prediction as the most hopeful method of validating the Rorschach. However, there are certain inherent difficulties even here As Ainsworth has already pointed out, the hypotheses relating to the Rorschach test are all concerned with inner dynamic processes. and as predictions can only be made in terms of observable behaviour these hypotheses would have to be re-stated in more behavioural terms. This is itself no easy task. Secondly, some criteria about which the prediction could be made would have to be set up, and as there are an infinite number of such criteria, it is unlikely that anything concerning the general nature of the test can ever be discovered this way. Using the criteria of recovery of schizophrenics after being given insulin, Piotrowski (1941), by studying Rorschach protocols, was able to predict almost completely successfully those who would improve and those who would not, being satisfied with his prediction in all but 7 out of 60 cases.

Of the two main studies where predictions of normal behaviour have been made either wholly or partially on the basis of the Rorschach, one shows it to be superior and the other shows it to be inferior to various objective tests. Munroe (1941, 1942, 1943), using standard administration combined with a partially objectified scoring system, in comparing the Rorschach with the Bernreuter, contends that the Rorschach is superior in predicting adjustment in college. As against this, Kelley and Fiske (1950) in predicting success in the V.A. Training Programme state that—

> "The most efficient clinical predictions, in terms of both validity and economy of data, are those based only on the materials contained in the credentials file and in the objective test profiles. The addition of autobiographical and projective test data appears to have contributed little or nothing to the validities of the assessment rating. . . . In fact, the predictions based on the credentials and objective tests are better than those made at the end of the programme on the basis of all tests, procedures and observations."

So one competent authority finds the Rorschach better than objective tests for prediction of college success and another finds it worse, and, in fact, says that information gained from it tends to lower the validity of predictions. It may be that in one case more skill was used in interpreting the protocols, or it may be that the partial objectification of Munroe's scoring system accounts for her greater success, but either way we have no more information than we can rely upon about the validity of the Rorschach.

So in all of the studies in these categories no one is found that is not open to sufficient criticism to vitiate its conclusions.

What if these specific criticisms were overcome and crucial experiments were designed and faithfully carried out? This would not seem impossible, for the experiments involving the use, for instance, of the Rosenzweig "blind" analysis technique have been criticized in performance alone, and not in principle.

The principle is that of the whole versus the part.

So far we have concerned ourselves only with those aspects of the problem which have adhered to the concept of the Rorschach as a whole. The complete overall view of the test is taken and compared, in one way or another, with the personality as a whole. Indeed, this would appear to be the only way. Piotrowski (1937) has drawn a parallel between the Rorschach signs, the clues upon which interpretations are based, and a set of mathematical equations. Just as no equation has any meaning by itself, so no single Rorschach sign has any significance unless it is regarded within the whole framework of the test responses. The point is further emphasized by Piotrowski's (1938) statement that—

> "since isolated aspects of personality have no meaning if considered separately from the total personality to which they belong, it is, of course, fundamentally wrong to attempt to validate isolated components of the Rorschach record with bits of behaviour. This cannot be too strongly emphasized."

Fortunately, this statement depends upon a questionable premise, for were it true the whole idea of personality study as a *science* would collapse. If it were correct to deny the possibility of isolating aspects of personality, then it would follow that the abstraction of common elements from diverse personalities would also be impossible, for they would have different meanings within their various contexts. In this case classifications of personalities would clearly be impossible and the basic requirements for scientific progress could not be met. Every single personality would be itself complete and unique, and no laws evolved concerning one could be generalized to apply to any other personality. This in itself may be the true state of affairs and would be no argument against the clinical use of the Rorschach for, as has been already demonstrated, it claims to do no more than give a personality description. If, however, this is the way things are, then we must give up all attempts to study personality scientifically and return to the ways of the arm-chair philosopher.

If we do this we find ourselves, *as do the current Rorschach workers*, talking in terms of "intelligence," "neuroticism," "emotion" and so on—talking, in fact, in the trait language of the scientist. So we find ourselves then in the awkward position of denying the possibility of scientific advancement in the field of personality, and at the same time using the terms and concepts which the scientist conceptualizes. The point, then, is that it is not theoretically impossible to defend the position that "isolated aspects of personality have no meaning," but that if this position is held two consequences must follow:

(1) a new language of personality description must be developed;
(2) the hopes of a science of personality must be abandoned.

Although adherents to this ideographic type of personality theory may admit of the second of these consequences, they most certainly do not respect the first, for nowhere do we find evidence of their renunciation of trait language.

Rightly or wrongly, then, it would seem better to depart from this axiom, and since the rest of Piotrowski's statement is made to follow from it, it too cannot be regarded as proven.

Other general arguments against the ideographic approach to personality could be raised, but would lead us too far afield. It is sufficient to turn to Ainsworth's (1951) remark that the—

> " holistic approach bears testimony to the uniqueness of personality organization, and generally indicates that the projective technique " probably has something," rather than providing evidence of the validity of the hypotheses upon which the interpretation is based. Correct matching is conceivable with only a few of the various hypotheses involved being valid, the rest being incorrest or inadequate."

The point becomes, then, using Ainsworth's terminology, that in the practical use of the Rorschach test certain hypotheses are advanced to account for certain apparently deviant responses, and just as all scientific hypotheses must be isolated and separately tested, so too must be these hypotheses about the Rorschach. In emphasizing that many of the Rorschach assumptions have yet to be validated, Wittenborn (1949*a*) too makes just this point.

Consideration of the more recent experimental examinations of the validity of the Rorschach does show a greater emphasis upon individual signs than upon the test result as a whole. Thus Williams (1947) and Baker and Harris (1949) designed experiments to test specifically the value of the so-called indicators of stress. In Williams's study, the protocol was taken under conditions calculated to arouse stress at the time, whereas in the experiment by Baker and Harris tendency to breakdown had been measured previously against an independent criterion. In neither case were the Rorschach signs found to be very indicative of stress. Other " sign " studies have been carried out by Eichler (1951) on anxiety, Holtzman (1950) on shyness, Hunter (1939) and Altus and Thompson (1949) on intelligence, and so on.* Lane (1948) did a novel study using hypnosis to test the validity of the movement responses. That this sort of analysis is likely to be the one that most workers will concern themselves with in the future seems most probable. Reviews by Benton (1950) and by Eysenck (1950) of recent work in this field lend support to this view.

Despite Piotrowski's objections mentioned above and apart from the arguments advanced herein against him, there is certainly authoritative encouragement for this line of attack. Rorschach himself says (1924) :

> " I consider it as being quite out of the question that even with great practice and experience, a certain and trustworthy interpretation could be obtained for the experimental record alone, *without calculation*." (Italics mine).

By this he undoubtedly points to the immense importance of the individual signs and, as the validity of any calculations made from these signs must of necessity be no more valid than the least valid of all the signs entering into such calculations, Rorschach would surely have been most anxious to establish the validity of each of his various signs. This must not be taken to mean that each separate scoring factor must be taken individually and *in vacuo* and separately tested. This technique has already been criticized, and rightly so, on the grounds that it is irrelevant, for if, say, the Rorschach hypothesis is that factors A, B, C, D together give an indication of personality factor X, then it is not legitimate to expect each of these variables to do so alone. Certainly one would not expect this from any other test. No one, for instance, would say that any one of the sub-tests of the Wechsler in itself gave an accurate score of intelligence, and nobody would think of isolating such a sub-test and generalizing results obtained from it to the test as a whole. Many such studies have been done on the Rorschach, and have met with much criticism from those who are familiar with the test. However, there is no reason why such combinations of signs as are hypothesized to be fruitful should not be effected in the manner suggested and the validity of the composite score examined experimentally. The problem, then, becomes one of finding the clues in the Rorschach protocols, either singly or in combination, which give the greatest insights into the personalities of the individuals producing those protocols.

---

* A more detailed discussion of such " sign " studies with particular reference to the colour category will be given in the second part of this paper.

A step forward in this direction can be made by examining those studies which have investigated the internal composition of the test. Originally examining a test for internal consistency meant correlating the scores from individual items in the test with the result of the whole test. In this way it was determined which items contributed highly to the value of the test and which were of less value or even irrelevant. Sargent (1945), in drawing attention to this, criticizes the somewhat different technique used with projective tests, whereby two or more such tests are given to a group of subjects to determine the amount of agreement between the tests. However, it is not necessary to depart from the original conception and, in fact, a return to it is actually desirable. This is especially so in the case of the Rorschach, where the importance of composite scores is so often emphasized. Where, for instance, it is argued that the number of well-organized whole responses, the number of good forms, the type of content and so on must be taken into account in assessing intellectual level from a Rorschach protocol, it is implied that these types of response have something in common. This would suggest a factor analytic study of the Rorschach signs to see if, in fact, the signs to be combined do have a common factor. Such studies have been carried out by a number of workers, including Hsü (1947), Adcock (1951), Sen (1950), and Cox (1951), with the object of extracting factors from the test and identifying those factors with those obtained from other tests.

That such studies can be of great practical value can be seen by reference to an article by Hughes (1950). In this study some twenty-two Rorschach signs of neuroticism, schizophrenia and organic defect appearing on protocols of one hundred such patients were inter-correlated and the resultant matrix factor-analysed. By using a simple method of weighting the rotated factor loading Hughes was able to classify correctly some 82 per cent. of diagnosed organics, whilst only 1 per cent. of the non-organics were misclassified. Many of the signs most highly saturated with this factor were, in fact, those commonly recognized to be indicative of organic defect. However, the factor analytic method was, in this case, able to do more than just validate the empirical hypotheses, for by attributing degrees of importance to the signs corresponding to their factor saturations, Hughes was able to effect a better classification than could be obtained by treating each of the relevant signs as of equal importance.

More important, however, are the studies of Wittenborn (1949*a*, 1949*b*, 1950*a*, 1950*b*), who goes even beyond the point of extracting factors from the signs. He points out (1949*a*) that in deriving scores by adding responses in the usual way, such as totalling all the C's, M's, F's, etc., two assumptions are involved, namely :

> " 1. That all the responses falling in a given category are similar in some behavioural aspect.
> 2. The psychological significance of responses falling in a given category is different in some respect from responses placed in other categories."

The first is a truly basic question and one which had previously been completely overlooked. That, for instance, all the responses scored by location as W should be combined had never been questioned by anyone, even after item analysis had become a firmly established technique in the field of psychometrics. It is just this first assumption which is put to the test when an item analysis is carried out. The second assumption cannot normally be said to apply to the majority of tests, for usually the construction of a test involved item selection so as to reduce measurement to that of one trait only. In the case of the Rorschach, where scores of different aspects of personality are taken at the same time, it becomes essential to separate these scores into their most useful categories. Such separation has, of course, been done but, as Wittenborn (1949*a*) points out, the basis of this separation has never been adequately checked and remains only an assumption.

In first checking these assumptions Wittenborn (1949*a*) gave a group Rorschach to 247 students. Altogether presence or absence of 7 human movement and 6 colour-form and form-colour responses were noted and tetrachoric correlations carried out for all possible combinations. The expected result, that the intra-correlations between the 7 movement and the 6 colour responses respectively would be larger than the inter-correlations of the movement and colour responses, was not confirmed. Using this and other data, Wittenborn (1949*b*) factor analysed his results and extracted six factors, but reported no obvious connection with the usual method of grouping Rorschach responses. However, it would be unfair to condemn the standard

Rorschach on this evidence, as the procedure was far from normal in that both group administration and check list scoring were used.

In a later, similar experiment using standard Rorschach procedure on some 240 students and psychiatric patients, Wittenborn (1950*a*) was able to produce evidence confirming the usual Rorschach groupings, at least with respect to colour and human movement. He concluded that—

> "The practice of combining the number of colour responses into a total score which is interpreted differently from the human movement total score appears to be justified. Moreover, since the colour scores are related with each other, it is quite possible that the total colour response scores could bear an important degree of relationship with some other response score, e.g., a measure of some practically important feature of personality."

So support is found for at least one of the normal scoring procedures, although no generalizations as to the behavioural concomitants can be drawn from these data.

To recapitulate, the first experimental analyses of the validity of the Rorschach attempted to correlate the overall picture obtained from the test with various types of overall personality pictures. This, having been found open to criticism, was followed by studies of the individual isolated signs. However, these in themselves have been criticized as being divorced from relevant Rorschach hypotheses. The next step, that of examining the internal construction of the test to see if the scores which are alleged to go together really do measure something in common, is just assuming prominence. The final step, then, is to examine closely the working concepts of the test, see which responses really do go together, and to correlate the emergent composite scores against predicted external criteria.

This sort of development has arisen out of the peculiar position accorded to so-called projective techniques, of which the Rorschach is one, within the whole framework of psychological testing. This position has to a large degree depended upon the ideographic outlook which already, in this paper, has been shown to be dangerously fallible. It is worth while now to turn to a more positive programme and see if and how the Rorschach and similar techniques can be fitted into a more scientifically hopeful nomothetic system.

One of the merits attributed to the Rorschach almost universally is stated by Hertz (1935) as follows:

> "Intelligence tests are criticized because they take little account of the concomitant emotional state of the subject. Personality tests are criticized in that they merely probe intelligence rather than the affective life of the individual. The Rorschach test, if reliable, would be unique in that it would at the same time reveal general intelligence level and expose the emotional traits, thus avoiding the errors ascribed to most 'personality' tests."

From this it would seem quite legitimate to conclude that the Rorschach is both an intelligence test and a personality test rolled into one, and that there is no reason to expect more from a Rorschach than from, say, a Binet and a Bernreuter combined.

However, what the statement probably means is that the Rorschach, instead of measuring some specific hypothesized trait or other, in some way measures an interactional factor which by its very nature tells us more about a patient than do any of these other tests.

If in objective tests of intelligence and personality all "elements" of personality are operative, it would seem reasonable to expect that suitable modifications of the scoring of such tests would give us just as much information of the total personality as does the Rorschach. In fact Ainsworth (1951) has admitted that an experienced examiner giving an intelligence test can report much more than a bare I.Q.

These reports and generalizations, she suggests, are made intuitively and are only learned through experience, which is just about the same sort of statement as is made about the Rorschach.

Suppose we now look a little more closely into the *modus operandi* of the Rorschach. The basic assumption underlying Rorschach procedure must be that a complete personality decription can be made from a combination of overt motor behaviour and verbal responses to unstructured visual stimulation. This particular principle is easily seen to be but one aspect of the more general statement that anything that an organism may do at any moment is, in some way or another, indicative of what that organism will do at any other moment.

Among others, Wolfle (1949) recognizes not only this general principle, but also the most important extension of it, namely that although every single act and instance of an organism's life is predictive, some acts are more so than others. The important point, then, is to discover just those occurrences which will account for the largest amount of the variation between the behaviour of organisms.

This principle is precisely that followed by the original factor analysts who set themselves the task of finding the smallest number of variables to account for the largest amount of variation in mental phenomena.

Having admitted, then, that every act, both active and passive, of an individual can be diagnostic, the next step is to single out those acts likely to be the most useful. Lombroso, Kretschmer and others decided to concentrate upon physical characteristics (which may be regarded as passive instances of behaviour), and Kretschmer in particular has built up a very imposing psychological system on this basis.

There have been studies relating the voice and personality (Allport and Cantril, 1934), and artistic style and personality (Vernon, 1933). Many attempts have been made to study the diagnostic clues afforded by characteristics of an individual's handwriting (Binet, 1906 ; Cantril and Rand, 1934 ; Allport and Vernon, 1933 ; and more recently by Eysenck, 1948). All these studies, together with that of Vernon (1935*a*) who studied the relation of facial expression to personality, and many other similar investigations have, to a small extent, been able to show a relation between the variable under investigation and personality, but always the degree of correlation has been low and pragmatically sterile.

It is not difficult to see how the Rorschach test fits into this category, as also does any other form of mental test. As in the Bernreuter, the M.M.P.I., and others, the behaviour is motor and overt, so in the Rorschach the type of behaviour elicited is visual-verbal. The patient looks at the cards, forms his associations and transfers them into verbal response. The question is, then, can we infer from these verbal responses and other associated behaviour more than we can infer from the responses to all the other variety of personality tests. Can we, in fact, say anything about the patient's behaviour in general from his behaviour in this particular situation.

This is not the first time that the position of the Rorschach as a projective technique has been called to question. Of the previous writers, although both Schachtel (1942) and Bellak (1944) are mainly concerned with the ambiguity of the definition of the term " projective," Eysenck (1950) specifically attacks the " projective "-" psychometric " test dichotomy, showing them to be quantitatively (along certain dimensions) but not qualitatively different.

The great advantage of the Rorschach in this respect is that in being a relatively unstructured test it allows of a greater variety of behaviour than do those tests specifically designed to examine pre-selected traits. This advantage is at the same time its greatest drawback, for in allowing a larger variety of responses it becomes encumbered with a greater complexity of scoring. The classical solution to this dilemma has been to ignore as far as possible these scoring details and proceed upon some intuitive overall impression gained from them. In some hands this procedure has appeared to produce profitable results, but the pitfalls involved in such practice have been shown greatly to outweigh its advantages.

Here, then, is the point. We have at our disposal a test from which it is possible to get simultaneously several composite scores pertinent to the patient's personality. Those who have had most occasion to employ this test have so far been satisfied to intuit from these data the kind of personality with which they are dealing. The hypothesis advanced here is that this is not the most advantageous use of the test, nor is it in line with scientific methodology. One of the aims of scientific research is to describe a given phenomenon, i.e., personality, in as few a number of variables as possible. Hence the object of psychological testing should be to measure that variable or those variables which either singly or in combination will account for the largest amount of variation between individuals.

The procedure, then, is clear. The individual scores and hypotheses concerning the Rorschach must be isolated and put to the test. Those that prove satisfactory should be retained, and those not fulfilling their original promise must be eliminated. In this way clues upon which diagnostic judgments are made can be examined and their value assessed, and at the same time those aspects of the test accounting for the greatest differences in observed personality pictures can be isolated.

The author wishes to acknowledge his indebtedness to Dr. H. J. Eysenck for his helpful criticism and suggestions in the preparation of this article.

BIBLIOGRAPHY.

ADCOCK, C. J., "A Factorial Approach to Rorschach Interpretation," *J. Gen. Psychol.*, 1951, **44**, 261.

AINSWORTH, M. D., "Some Problems of Validation of Projective Techniques," *Brit. J. Med. Psychol.*, 1951, **24**, 151.

ALLPORT, G. W., and CANTRILL, H., "Judging Personality from the Voice," *J. Soc. Psychol.*, 1934, **5**, 37.

Idem and VERNON, P. E., *Studies in Expressive Movement*, 1933. New York: The Macmillan Co.

ALTUS, W. D., and THOMPSON, G. M., "The Rorschach as a Measure of Intelligence," *J. Consult. Psychol.*, 1949, **13**, 341.

ASH, P., "The Reliability of Psychiatric Diagnoses," *J. Abnorm. and Soc. Psychol.*, 1949, **44**, 272.

BAKER, L. M., and HARRIS, J. S., "The Validation of Rorschach Test Results against Laboratory Behavior," *J. Clin. Psychol.*, 1949, **5**, 161.

BELL, J. E., *Projective Techniques*, 1948. New York: Longmans, Green & Co.

BELLAK, L., "The Concept of Projection," *Psychiatry*, 1944, **7**, 353.

BENJAMIN, J. D., and EBAUGH, F. G., "The Diagnostic Validity of the Rorschach Test," *Amer. J. Psychiat.*, 1938, **94**, 1163.

BENTON, A. L., "The Experimental Validation of the Rorschach Test," *Brit. J. Med. Psychol.*, 1950, **23**, 45.

BINET, A., *Les révélations de l'ésriture d'après un control scientifique*, 1906, Paris: Félix Alcan.

BRUSSEL, J. A., and HITCH, K. S., "The Rorschach Method and its Uses in Military Psychiatry," *Psychiat. Quart.*, 1942, **16**, 3.

CANTRIL, H., and RAND, H. A., "An Additional Study of the Determination of Personal Interests by Psychological and Graphological Methods," *Charac. and Person.*, 1934, **3**, 72.

COX, S. M., "A Factorial Study of the Rorschach Responses of Normal and Maladjusted Boys," *J. Genet. Psychol.*, 1951, **79**, 95.

CRONBACH, L. J., "Statistical Methods Applied to Rorschach Scores: a Review," *Psychol. Bull.*, 1949, **46**, 393.

EICHLER, R. M., "Experimental Stress and Alleged Rorschach Indices of Anxiety," *J. Abnorm. and Soc. Psychol.*, 1951, **46**, 344.

EYSENCK, H. J., "Neuroticism and Handwriting," *ibid.*, 1948, **43**, 94.

Idem, "Personality Tests: 1944–1949" (ed. G. W. T. H. Fleming), *Recent Progress in Psychiatry*, 1950, 2.

GARFIELD, S. I., "The Rorschach Test in Clinical Diagnosis," *J. Clin. Psychol.*, **3**, 1947, 375.

HERTZ, M. R., "The Rorschach Ink-Blot Test: Historical Summary," *Psychol. Bull.*, 1935, **32**, 33.

Idem, "Validity of the Rorschach Method," *Amer. J. Orthopsychiat.*, 1941, **11**, 512.

Idem, "Rorschach: Twenty Years After," *Psychol. Bull.*, 1942, **39**, 529.

Idem, "The Rorschach Method: Science or Mystery," *J. Consult. Psychol.*, 1943, **7**, 67.

Idem and RUBENSTEIN, B. B., "A Comparison of Three 'Blind' Rorschach Analyses," *Amer. J. Orthopsychiat.*, 1939, **9**, 295.

HOLTZMAN, W. H., "Validation Studies of the Rorschach Test: Shyness and Gregariousness in the Normal Superior Adult," *J. Clin. Psychol.*, 1950, **6**, 343.

HSÜ, E. H., "The Rorschach Responses and Factor Analysis," *J. Gen. Psychol.*, 1947, **37**, 129.

HUGHES, R. M., "A Factor Analysis of Rorschach Diagnostic Signs," *ibid.*, 1950, **43**, 85.

HUNTER, M., "The Practical Value of the Rorschach Test in a Psychological Clinic," *Amer. J. Orthopsychiat.*, 1939, **9**, 287.

KELLY, E. L., and FISKE, D. W., "The Prediction of Success in the V.A. Training Programme in Clinical Psychology," *Amer. Psychol.*, 1950, **5**, 395.

KRUGMAN, J. I., "A Clinical Validation of the Rorschach with Problem Children," *Rorschach Res. Exch.*, 1942, **6**, 61.

LANE, B., "A Validation Test of the Rorschach Movement Interpretation," *Amer. J. Orthopsychiat.*, 1948, **18**, 292.

McFARLANE, J. W., "Problems of Validation Inherent in Projective Methods," *ibid.*, 1942, **12**, 405.

MEYER, B. T., "An Investigation of Color Shock in the Rorschach Test," *J. Clin. Psychol.*, 1951, **7**, 367.

MIALE, F. R., CLAPP, H., and KAPLAN, A. H., "Clinical Validation of a Rorschach Interpretation," *Rorschach Res. Exch.*, 1938, **2**, 153.

MICHAEL, J. C., and BUHLER, C., "Experiences with Personality Testing in a Neuropsychiatric Department of a Public General Hospital," *Dis. nerv. Sys.*, 1945, **6**, 205.

MUNROE, R., "Inspection Technique," *Rorschach Res. Exch.*, 1941, **5**, 166.

Idem, "An Experiment in Large Scale Testing by a Modification of the Rorschach Method," *J. Psychol.*, 1942, **13**, 229.

Idem, "Use of the Rorschach in College Counseling," *J. Consult. Psychol.*, 1943, **7**, 89.

PIOTROWSKI, Z. A., "The Reliability of Rorschach's Erlebnistypus," *J. Abnorm. and Soc. Psychol.*, 1937, **32**, 439.

Idem, "Blind Analysis of a Case of Compulsion Neurosis," *Rorschach Res. Exch.*, 1937–1938, **2**, 89.

Idem, in discussion of paper by Benjamin and Ebaugh, *Amer. J. Psychiat.*, 1938, **94**, 1176.

Idem, "The Rorschach Method as a Prognostic Aid in the Insulin Shock Treatment of Schizophrenics," *Psychiat. Quart.*, 1941, **15**, 807.

RORSCHACH, H., and OBERHOLZER, E., "The Application of the Interpretation of Form to Psychoanalysis," *J. nerv. ment. Dis.*, 1924, **60**, 225.

ROSENZWEIG, S., "Outline of a Co-operative Project for Validating the Rorschach Test," *Amer. J. Orthopsychiat.*, 1935, **5**, 121.

ROSS, W. D., "Rorschach Interpretations and Clinical Diagnosis," *J. Proj. Tech.*, 1950, **14**, 5.

SARGENT, H., "Projective Methods: their Origin, Theory and Application in Personality Research," *Psychol. Bull.*, 1945, **42**, 257.

SCHACHTEL, E. G., Review: "The Rorschach Technique by Bruno Klopfer," *Psychiatry*, 1942, **5**, 604.

SEN, A., "A Factorial Study of the Rorschach Test," *Brit. J. Psychol.*, (*Stat. Sect.*), 1950, **3**, 21.

TROUP, E., "A Comparative Study by Means of the Rorschach Method of Personality Development in 20 Pairs of Identical Twins," *Genet. Psychol. Monog.*, 1938, **20**, 461.

VERNON, P. E., "Some Characteristics of a Good Judge of Personality," *J. Soc. Psychol.*, 1933, **4**, 42.

Idem, "Can the Total Personality be Studied Objectively?" *Charac. and Person.*, 1935*a*, **4**, 1.

Idem, "The Significance of the Rorschach Test," *Brit. J. Med. Psychol.*, 1935*b*, **15**, 199.

Idem, "The Matching Method Applied to Investigations of Personality," *Psychol. Bull.*, 1936, **33**, 149.

WILLIAMS, M., "An Experimental Study of Intellectual Control under Stress and Associated Rorschach Factors," *J. Consult. Psychol.*, 1947, **11**, 21.

WITTENBORN, J. R., "Statistical Tests of Certain Rorschach Assumptions: Analysis of Discrete Responses," *ibid.*, 1949*a*, **13**, 257.

Idem, "A Factor Analysis of Discrete Responses to the Rorschach Ink-blots," *ibid.*, 1949*b*, **13**, 335.

Idem, "Statistical Tests of Certain Rorschach Assumptions: the Internal Consistency of Scoring Categories," *ibid.*, 1950*a*, **14**, 1.

Idem, "A Factor Analysis of Rorschach Scoring Categories," *ibid.*, 1950*b*, **14**, 261.

WOLFLE, H. M., "A Fundamental Principle of Personality Measurement," *Psychol. Rev.*, 1949, **56**, 273.

A PRELIMINARY INVESTIGATION INTO ABREACTION COMPARING METHEDRINE AND SODIUM AMYTAL WITH OTHER METHODS

By F. Houston, M.R.C.S., L.R.C.P., D.P.M.,
Assistant Psychiatrist to De La Pole Hospital, Willerby, Hull.

In abreaction under any of the methods in use, a phase of cortical excitation is followed by a phase of temporary cortical inhibition with rupture of pre-existing patterns of conditioned reflexes and behaviour, a phase in which new modes of behaviour are easily adopted, the ultra-paradoxical phase (Pavlov, 1934). In this phase the patient is extremely suggestible, and this corresponds to psychological transference always found in post-abreactive states (Shorvon and Sargant, 1947).

An emotional discharge takes place during the period of excitation, the predominant reactions being fear or anger. If the patient is made to re-live through emotionally charged events which coincided with the onset of symptoms, chiefly of an hysterical nature, by first of all being encouraged to talk about these events and describe them down to the minutest detail in the present tense, and is then given a drug which diminishes cortical inhibition, those events become real to the patient. There is wonderful relief of tension and the symptoms disappear. It is not so important to release repressed memories as to produce a strong emotional display and the result is proportional to the emotional display (W. Sargant, 1948). The patient lives through the emotions experienced at the time of the conflict producing his symptoms. He sees the events happening and takes part in them. In some cases he even appears to be hallucinated both visually and auditorily in relation to these happenings. For example :

Case 1.

Following the fall of a bag of stone on his neck, the patient, a man aged 25, suffered concussion with a lapse of consciousness. After his discharge from hospital he had attacks of dizziness, blackouts, and headaches. Examination of the central nervous system and X-ray of the skull showed no abnormality. Under ether abreaction he wept copiously and without restraint though he couldn't give any reason for his weeping ; he just felt miserable and unhappy. His symptoms were relieved after this, but not gone. A course of electric convulsion therapy given because he was depressed caused a buzzing noise in his head but no further change in his condition. Under methedrine and sodium amytal technique, shortly to be described, he relived the accident. He showed extreme panic and terror shouting, " I can't move my legs. I'm useless. I'm no good." Then followed a period of relaxation and inhibition when all was quiet. He suddenly jumped off the couch extremely agitated, trembling and in great fear. He stated that he had actually seen his father's vision, and revealed strong feelings of guilt because he had quarrelled with his father and pushed him down three weeks before the latter's death. His father took to his bed, never spoke to the patient again, and died from phthisis. This happened a year before the accident. So strong was his feeling of guilt that at times of emotional stress he saw a vision of his father. This had apparently occurred at the time of his accident, which he considered as a form of retribution for having, as he believed, caused his father's death. After this abreaction he became extremely restless, agitated and panicky, and had to be put to bed and sedated. The next day he was able to recall everything he had said and got rid of all his symptoms, had peace of mind and wonderful relief of tension.

Ether gives a better abreaction than pentothal, though the latter is highly suitable for abreaction in battle anxiety states of acute and recent onset, and for releasing hysterical amnesias. But a better method is to use sodium amytal gr. 3 injected intravenously (the patient lying relaxed on a couch with the blind drawn). A state of clouding of consciousness with release of emotional tension takes place, and this is immediately followed, using the same needle but a different syringe, by methedrine 30 mgm. in aqueous solution intravenously (methedrine is precipitated by alkaline solutions). Then there is an onset of push of talk with flight of ideas, rapid pulse, rise in blood-pressure, and dilation of pupils. The patient can no longer voluntarily suppress valuable information as he can with ether or pentothal. Moreover he remains sufficiently conscious the whole time, and usually gives a more powerful abreaction with subsequent relief of emotional tension than with ether.

With the latter some of the material divulged is partly repressed and "forgotten" when the session is terminated, whereas with methedrine and sodium amytal the connection between this emotional conflict and highly significant somatic symptoms remains in consciousness. The patient is thus able to see his problems more clearly, and gains greater insight into his personality defects.

The superiority of methedrine abreaction to ether abreaction in hysterical conditions of fairly recent onset is illustrated by the following cases:

Case 2.

A tug-master aged 46 suffered from hysterical depression ever since he collapsed on the bridge of his ship and developed an hysterical paresis lasting for 3 weeks in 1944. He conversed freely about his unhappy childhood and feelings of guilt about sodomy committed with his wife; because she used a bad word during intercourse he lost all faith in her; he now has a phobia that he might strangle his daughter.

Under ether he was encouraged to talk about the War—he was mine-sweeping. He showed a fear reaction with sobbing and writhing about the bed shouting that he was a coward and no good, that he was blamed for not rescuing a man who had fallen overboard. After this abreaction his depression disappeared but he still felt he had to tell me more. He then mentioned a homosexual incident which had occurred when he was 12 years of age. Under methedrine and sodium amytal he gave a more powerful abreaction with fear and horror of the blitz on the Humber, the fear paralysing his right arm as he relived those terrible days on the bridge of his ship. Then followed an outburst of sobbing and crying as he described his disillusionment with his wife. He also revealed some extreme egotism and underlying paranoid trends, saying he was the best skipper in the world but that everyone was jealous of him. Since the treatment there has been considerable improvement, his phobias have gone and he has regained self-confidence, though he still remains obsessional about his wife.

Case 3.

An emotionally immature man of 38 with a mother-fixation complex suffering from an hysterical depression with anxiety, and complaining of being unable to have an erection with his fiancée. Under ether he abreacted with sobbing saying "there's something there doctor." Whatever it was it never became conscious. As a result of this he was relieved for 2 days, then he developed headaches, anxiety and depression again. He was so agitated that he was given prolonged narcosis, he made an excellent recovery and got married. He returned 5 months later complaining of weakness in his arms and legs and depression, though he ate and slept well. Under methedrine and sodium amytal he abreacted well, with threshing of arms shouting and cursing at his father, who had returned home drunk and beat him when he was a little boy. He also revealed that his feeling for his wife was a psychological transference of his mother-fixation complex since his mother had died. After this abreaction his symptoms cleared up and with them asthma, which he has had for the past 2 years since his mother's death. It is interesting to note in this case that improvement resulted from prolonged narcosis. Could this be explained on the basis of his obsession about not being able to have an erection, by Pavlov's experiments in curing obsessional dogs with bromide?

Case 4.

A man aged 36 with an acute hysterical reaction originating since his discharge from the Army in 1945. He complained of headaches, irritability with his own children (is a male nurse in a children's hospital), fear of the dark since the War, and chronic constipation for two years. Under ether he gave a slight aggressive abreaction, and revealed how, whilst driving a taxi two years ago he had been forced by two ruffians to transport a stolen safe in his taxi. After this treatment his constipation disappeared and his irritability and anxiety diminished. Under methedrine and sodium amytal there was a subjective feeling of unreality as the drug was being injected, then marked push of talk with some clouding of consciousness and disorientation for time (he thought the treatment lasted for 4 hours, whereas it only lasted for ½ hour). His fear of the dark was traced back to the period of watching in the desert at night in 1943. There he was ambushed by Arabs (he had a violent aggressive outburst at this point). He shot it out and the Arabs fled, one having been killed. After this his remaining symptoms disappeared, and he lost his fear of the dark.

Case 5.

A man aged 52 complained of hypochondriacal pains and weakness in his legs, anxiety, and headaches. He had not worked since 1942, he also had chronic bronchitis. Under pentothal he did not abreact but revealed partially repressed material of the 1914–18 War. A shell exploded near him, he saw his comrades fall, started running, thought of throwing down his rifle but didn't, saw things as if through a mist, then his legs gave way and he collapsed. This session produced a slight relief from his anxiety and headache, but the pains in his legs persisted. Under ether he showed a slight fear abreaction of the 1914–18 War. He also revealed an incident in 1940 when in the R.A.F. balloon barrage; he developed bronchitis at a period of great stress during the blitz, and the officer in charge told him that he had no sense of responsibility and would have to go. This made him feel useless, and that is why he has been in bed on and off ever since. Much sobbing and weeping followed this revelation. A trance-like state then ensued in which suggestion was utilized to remove his symptoms. There was temporary improvement, but the symptoms returned on the following day. Under methedrine and sodium amytal there was no abreaction, but push of talk and flight of ideas. There was a repetition of past events and a revelation of strong obsessional trends. That night the patient only slept two hours. The next morning he felt exhausted, depressed, had severe headache, and was much worse. He was then given a course of electric convulsion therapy and to our surprise all his symptoms cleared up.

This case illustrates that deep cortical inhibition which is present in a true endogenous depression with hysterical superstructure as in this case requires a deeper excitation to break down the faulty behaviour pattern. It is believed that electric convulsion therapy has this deeper stimulating effect (Gellhorn, 1946), and it is also a form of abreaction (Sargant and Shorvon, 1945). It is probable that in a patient with such a long history the symptoms will return despite treatment as they did in the case of Pavlov's dogs, which, he considered, was due to the pathological inertia of those with weak nervous systems. (Pavlov, 1934).

Why did this case give such a poor response to methedrine? There were strong obsessional trends present and Pavlov interprets obsessions as an abnormal predominance of the excitatory process in the cerebral cortex. An overstraining of the excitatory process produce by methedrine, whose effect lasts for several hours, is bound to aggravate the condition.

The next case shows the advantage of methedrine over ether for patients with pulmonary disease.

Case 6.

A man aged 40 who had suffered from asthma for 9 years, with no response to ordinary medical treatment. Under methedrine and sodium amytal he gave a violent abreaction, with maniacal excitement and aggression against the male nurses, using obscene language and calling them —— Germans. He was living through the time when he tried to put out an incendiary bomb during the blitz, and was gasping for breath from the smoke which had been the trigger for his asthma; but what had upset him was that he had claimed to the neighbours that he could put out the bomb unaided, but had been unable to do so and thus felt that he had not spoken the truth. When his asthma persisted he had said to various people, "I'll give you £100 if you cure my asthma," knowing full well that he would not do so. He felt as though he had told a lie because if he said a thing he always liked to carry it out to the letter. His asthma was thus partly an obsessional symptom, but also signified repressed aggressive trends. During the treatment the patient spoke rapidly with flight of ideas, push of talk, protruding eyeballs, dilated pupils and rapid pulse. On examination after the treatment his asthma had gone. The patient remained elated and pranced up and down the ward to show how fit he was. He remained talkative and didn't sleep that night, but felt much relief of tension the next day and has remained free from asthma.

Case 7.

Case 7 produced an unsatisfactory response to treatment; it was a case of sudden onset of spasmodic torticollis commencing 6 months ago in a man aged 28 who had a good Army record without any breakdown in battle. Under ether it was revealed that the onset was related to strong frustration by the landlord of the flat in which he and his wife lived, and his feeling of hatred for this landlord. However, he is a tense, rigid, obsessional type of personality with no interests or hobbies outside his work, brought up in a church-going household, taught never to swear in his life. He did not abreact at all, either under ether or methedrine. Treatment with Parpanit, E.C.T. and prolonged narcosis produced no improvement. This is in keeping with the findings of Shorvon and Sargant, who state that strongly obsessional personalities do not abreact; they simply relate events in a matter-of-fact quiet sort of way, and their symptoms remain as deeply ingrained behaviour patterns, in keeping with Pavlov's concepts.

Case 8.

Case 8 illustrates some of the disadvantages of methedrine. This was a case of globus hystericus related to frustration of ambition, and feeling of resentment at his superiors (he was a naval gunnery inspector). After the session with methedrine he felt so elated and was so lacking in his usual reserve that he spoke to a girl near the bus stop outside the hospital, said he couldn't wait for the bus, and would she walk with him. He then thumbed a lift, a thing he would never do normally. That night he didn't sleep, but sat up writing his life-history. This eventuality must be guarded against in treatment by methedrine by sedating the patient after the treatment is over and providing further sedation for the night-time.

SUMMARY.

An investigation is made into the results of abreaction with methedrine and a comparison made between it and other methods of abreaction.

This is illustrated by eight cases, and the technique of abreaction with methedrine and sodium amytal is described. Its advantages and disadvantages are discussed in the light of Pavlov's theories on conditioned reflexes.

REFERENCES.

GELLHORN, *Arch. Neurol. Psychiat.*, 1946, **56**, 2, 216.
PAVLOV, *Conditioned Reflexes in Psychiatry*, 1934, Lawrence & Wishart.
SARGANT, W., *Dig. Neurol. Psychiat.*, 1948, **16**, 193.
Idem and SHORVON, H. J., *Arch. Neurol. Psychiat., Chicago*, 1945, **54**, 231.
SHORVON, H. J., and SARGANT, W., *J. ment. Sci.*, 1947, **93**, 709.

THE ELECTROENCEPHALOGRAM IN AGED PATIENTS OF A MENTAL HOSPITAL.

By W. McAdam, M.D., M.R.C.P.I., D.P.M., and W. T. McClatchey, M.B., D.P.M.
From the Department of Clinical Research, Crichton Royal, Dumfries.

[Received 6 May, 1952.]

This paper describes a preliminary survey, in which an attempt was made to discover if recognizable E.E.G. patterns could be correlated with consistent patterns of behaviour in a group of aged mental hospital patients.

The general characteristics of the E.E.G. in old age have been described. Greenblatt (1944) in a large survey of very varied neuropsychiatric cases found that the senile and arteriosclerotic psychoses were included among those in which abnormal slow activity in the E.E.G. had a peculiarly high incidence. Hoch and Kubis (1941) found the E.E.G. to be very variable in senile dementia, 5 to 7/sec. activity being common, while many had low voltage records. Davis (1941) reported that the fast alpha rhythms of 11 and 12/sec. were absent in their patients over 70 years of age, and that the alpha index decreased with old age while there was a simultaneous increase in slow delta activity. Mundy-Castle (1951) confirmed that the mean alpha amplitude was significantly less in a senile than in a younger group, but noted that in contra-distinction to this, the theta activity, when it occurred in seniles, was of significantly higher amplitude than the theta activity observed in the younger group. However, suprisingly in view of the impression derived from the previously-mentioned papers, suggesting that slow activity is the most characteristic feature of the E.E.G. in old age, he noted that there was a statistically significant decrease in theta activity in the senile group as compared with the younger group. Of 12 senile subjects displaying theta activity, 10 possessed abnormal E.E.G.'s. He concluded that theta activity occurring over the age of 65 years and associated with an abnormal E.E.G. represented a different process from that occurring in the younger age-groups, in which it is regarded as a reflection of maturation processes.

Observations on the mental states of the individuals whose E.E.G.'s are described are not numerous. Davis and Davis (1939) noted that an alert old woman with general arteriosclerosis had a normal E.E.G. which began to show slow activity as her faculties began to fail; and Liberson and Seguin (1945) found that confusion and irritability were more marked in those of their senile and arteriosclerotic patients who had abnormal slow records, whereas anxiety, agitation and delusions were more marked in others.

In the present paper no new description of the E.E.G. of old age is attempted; but as it is clear that the E.E.G. in old age is very variable, a search is made for clinical correlates of some of the more easily recognizable types of E.E.G.

Material and Method.

The clinical states and electroencephalograms of sixty-five patients were studied. The patients were of 60 years of age or over. Their psychiatric diagnoses were diverse, including schizophrenia, depressions of various types, senile and arteriosclerotic dementia, and others. The patients were ambulant and had no physical signs or symptoms of focal neurological disease.

Recording was by a six-channel Ediswan electroencephalograph using bipolar silver-silver chloride saline pad electrodes. The E.E.G. was reported with regard to frequency of the alpha rhythm, its distribution, responsiveness to visual attention, microvoltage, and the alpha index (Saul *et. al*, 1937). The last gives an indication of the percentage of the record from the occipital areas occupied by the alpha rhythm. For the purpose of this measurement, any frequency from 8–13/sec. was included if there was a clearly recognizable run of at least three waves of a microvoltage of ten or more. It was not possible to define the faster rhythms with any clarity. Lower frequencies were reported as to their microvoltage, frequency and number of clearly recognizable waves per minute, or as to per cent. time if they were numerous.

Intellectual deterioration was determined by psychiatric interview. Orientation for name, age, situation and time was easily assessed, but because of variable co-operation, memory and concentration were more difficult to determine. Four rough groupings were therefore used, according to the probable value of the psychiatric assessment.

1. "*No deterioration*": In these patients co-operation was good and the assessment reasonably accurate.

2. "*Probably no deterioration*": Applied to two patients only. These were individuals who were usually withdrawn but occasionally engaged in conversation sufficiently to permit some questioning.

3. "*Probably some deterioration*": This was applied to three patients who were unco-operative, suspicious or deluded. In these cases the patient could sometimes be persuaded into conversational situations in which he had to use memory and concentration; the psychiatrist exercised his judgment on this, taking into account also the patient's psychiatric history and the degree to which he was capable of discussing his own and general affairs.

4. "*Definitely deteriorated*": This group includes two different types of patient. One of these is the patient, typically an arteriosclerotic, who has insight into his disabilities and has a tendency to evade questions which would uncover his limitations. The other type is that of the co-operative patient whose responses make it very obvious that deterioration is present. The clinical description of the majority of the cases was made by one of us (W. T. McC.) without knowledge of the E.E.G., and the E.E.G. was reported by the other (W. McA.) with no knowledge of the patient to whom it referred. There were 10 cases in whom the E.E.G. had been seen when the case was described. The final assessment of these cases was reached after discussion and agreement between the authors.

FINDINGS.

Davis's observation, that in patients of over 70 years the fast alphas of 11 and higher were not found did not hold for this series. In 33 patients of 70 and over, an alpha of 11/sec. or over was found 4 times, and in 59 patients of 60 years and over it was found 11 times.

No correlation could be made out between the alpha index and the alpha frequency. The presence of rhythmic activity in the alpha band from the frontocentral areas could not clearly be shown to correlate with the microvoltage of the alpha from the occipital areas. A slight correlation, however, was found between the alpha index and the frontocentral rhythm, there being a tendency for the alpha index to be high in cases where alpha activity was found in the frontocentral areas (Fig. 1). There was also a small correlation between the alpha index and the microvoltage (Fig. 2).

Fifteen patients gave records showing definitely abnormal slow activity. The mildest degree of this showed waves of 4 to 7/sec., of a microvoltage of about two-thirds that of the alpha, and occurring as often as about 30 or more such waves in a minute. In the grossly abnormal records 2 to 7/sec. activity was almost continuous. In 14 of these 15 cases there was evidence of intellectual deterioration, 13 being described under " definite deterioration " and one under " probably some deterioration." The individual considered to be showing " probably no deterioration " was described in the psychiatric summary as " an arrogant, withdrawn, deluded old schizophrenic of long standing."

Fifty patients gave normal records, and 47 were considered to show " no deterioration." Of the 3 others, one " probably not deteriorated " was an old schizophrenic, and two " probably deteriorated " were also schizophrenics, one an active old dement, grossly deluded and apparently quite deteriorated, while the other was " superficially lucid; orientation varies, but he always knows the hospital and people."

The table below summarizes this distribution of deterioration and E.E.G. abnormality:

TABLE I.

E.E.G.	Psychiatric assessment.	
Abnormal, 15	Definitely deteriorated	13
	Probably deteriorated	1
	Probably no deterioration	1
Normal, 50	Not deteriorated	47
	Probably deteriorated	2
	Probably no deterioration	1

From this it can be seen that when the psychiatric assessment was given with confidence and without qualification an abnormal E.E.G. was associated with intellectual deterioration, and a normal E.E.G. with no deterioration.

The 47 E.E.G.s of patients who were not deteriorated were then considered. No correlation could be made out between on the one hand psychiatric diagnosis, sex, age, duration of stay in hospital or prevailing mood, and on the other hand alpha frequency, distribution, index or microvoltage. The E.E.G.s were then arranged in a series, from that with the highest to that with the lowest alpha index. There were 16 patients in whom the alpha index was below 50. The psychiatric assessment of each of these patients included a statement to the effect that he was a restless or " active " individual. There were 31 patients with an alpha index of over 50 and 25 of these were considered to be inactive, quiet, "passive " individuals.

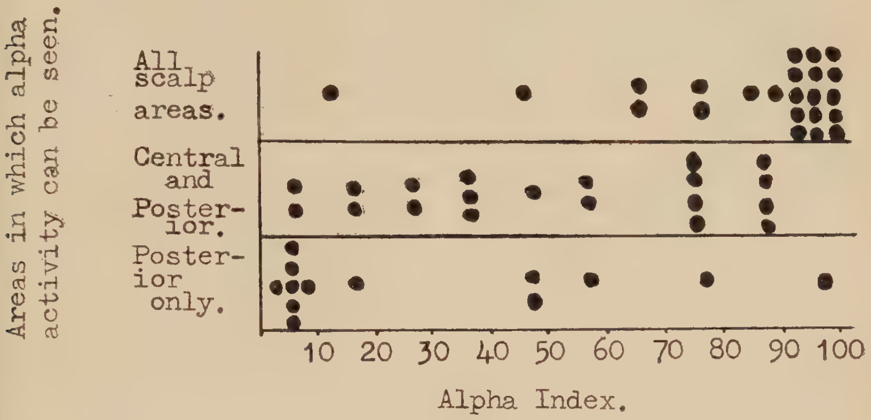


FIG. 1.

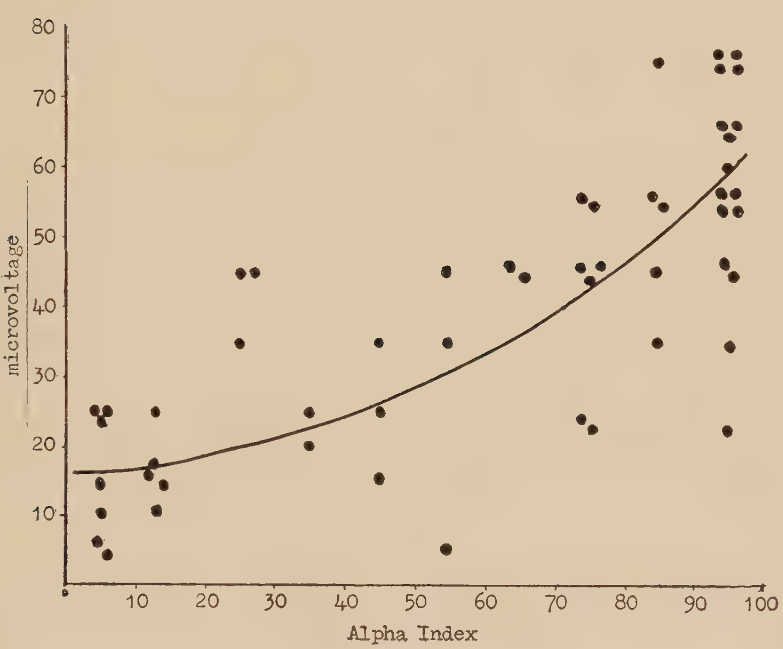


FIG. 2.

The assessment of activity or passivity involved an impressionistic judgment by the psychiatrist in consultation with the nursing staff. In the majority of cases the distinction was relatively clear and simple. The " passive " or " inactive " individuals typically took little interest in their surroundings, rarely made any attempt to break their routine, and often required a good deal of prompting even to look after their immediate affairs ; whereas the " active " or " restless " individuals were usually well informed on local gossip, showed an interest in general affairs, and had hobbies and interests outside their routine. In some patients the decision involved some careful weighing of circumstances. For example, a physically healthy, intelligent woman, recovered from an organic confusional state, who had an assured income and a good home where a few responsibilities awaited her, was considered to be in the inactive or " passive " group, despite full attendance at classes and entertainments, because she continually postponed her date of departure on trivial pretexts. Another woman was considered to be " active " although her class and work record was essentially the same as that of the aforementioned patient. Her work record was maintained although she had several physical disorders which could have been used as an excuse to lead a much more indolent life, had she wished.

The nurses' daily reports were consulted for further information, and in the " passive " group, confirmatory information was found, in expressions such as " quiet and rather uninterested," " lazy," " apathetic," and " gives no trouble." In the " active " group, 10 of the 16 patients frequently figured in the reports because of mild disturbances their activity or restlessness had provoked. This took various forms, of which meddlesome interference with other patients, incessant importunities and recurrent failure to observe parole regulations were the commonest.

There were 6 patients who were restless and over-active, whose E.E.G.'s showed a high alpha index. Four of these were cases of recurrent mania or hypomania. The two others were cases of recurrent depression in remission at the time of examination. They had never been considered manic in the intervals between the depressions.

Discussion.

In this study the observations that abnormal slow activity in the E.E.G. is of particularly high incidence in the senile and arteriosclerotic psychoses is confirmed. The correlation between the appearance of abnormal slow activity and intellectual deterioration is high, although not perfect. As the series included a wide variety of disorders, it is possible that inability to co-operate in the examination from other causes than intellectual deterioration of the senile and arteriosclerotic types is to be considered, particularly as the 5 cases in which the psychiatric assessment was uncertain and qualified were withdrawn and unco-operative schizophrenics. It was not possible to show any correlation between the degree of deterioration and the degree of abnormality in the E.E.G., possibly for similar reasons. It will be necessary to carry out further observations on a more homogeneous series of cases of senile and arteriosclerotic degeneration.

It is probable that impaired cerebral blood-flow is an important factor in producing the abnormal E.E.G. and the intellectual deterioration in senile and arteriosclerotic patients. In this series no correlation whatever could be made out between the state of the peripheral arteries and the E.E.G. or the presence or absence of deterioration. This is not at all surprising, as palpable peripheral arteries indicate medial sclerosis which runs a benign and symptomless course (Firstbrook, 1951). Freyhan *et al.* (1951), however, have shown that there is a significant reduction in cerebral blood-flow; oxygen consumption and an increase in cerebrovascular resistance in patients with senile and arteriosclerotic psychoses as compared with young adults. Kety *et al.* (1948), Lovett Doust and Schneider (1952) and many others have drawn attention to mental changes that occur in anoxic anoxia; and Brazier (1946), Davis *et al.* (1938) and Gibbs and Davis (1935) have described the slowing of the E.E.G. that occurs with anoxia. Since anoxia, slow activity in the E.E.G. and confusion are associated under experimental conditions in young subjects, and impaired cerebral circulation has been found in senile psychoses in which there is also abnormal slow activity in the E.E.G., it is tempting to relate the latter to the impaired cerebral circulation and anoxia. It remains, however, to be shown that there is a difference between deteriorated and non-deteriorated aged individuals in respect of cerebral blood-flow and oxygen consumption.

The findings in the group in which the E.E.G. was normal agree fairly closely with those of Saul *et al.* (1937–1949), who studied individuals in psychoanalysis and found a high alpha index to be characteristically associated with a passive dependent, receptive attitude ; submissiveness, a desire to retreat from others and from dangers, effort and responsibility ; while a low alpha index was usually associated with a " consistent, well-directed, freely indulged drive to activity." They distinguished this from the hypomanic type of activity, which they consider to be in the nature of a defence, and which is associated with a high alpha index. In the present series hypomania and mania was associated with a high alpha index, and these cases formed the chief exception to the finding that there was a correlation of passivity with a high alpha index. In all cases where the alpha index was low the subjects were considered to be active individuals.

In this preliminary survey the descriptions implied by the terms " passivity " and " activity " are only approximate and imprecise, the formulation of the cases having been largely impressionistic. Further studies are in progress in the hope of discovering more definitely the qualities of behaviour which led to these impressions, and so evolving better defined descriptions.

SUMMARY.

E.E.G.'s were taken from 65 individuals of 60 years and over, suffering from a variety of psychiatric disorders.

In 15 patients there was abnormal slow activity in the E.E.G., and in 13 of these there was reliable evidence of intellectual deterioration.

In 50 patients the E.E.G. was normal, and 47 of these showed no sign of intellectual deterioration.

In 16 out of these 47 patients there was a low alpha index, and these were considered to be active, restless individuals.

In the other 31 there was a high alpha index. Twenty-five were considered to be passive, inactive individuals, while of the remaining 6, 4 were cases of recurrent mania and 2 of recurrent depression.

ACKNOWLEDGMENTS.

We wish to thank Dr. P. K. McCowan, Physician Superintendent, for permitting and facilitating these studies, Dr. Mayer-Gross for criticism and direction, Miss Corrie for exemplary patience in obtaining excellent records from often refractory cases, and numerous nurses for their devotion in giving information and seeking out and abstracting ancient reports.

BIBLIOGRAPHY.

BRAZIER, M. A. B., *Arch. Neurol. Psychiat.*, 1946, **56**, 752.
DAVIS, H., and DAVIS, P. A., *Amer. J. Psychiat.*, 1939, **95**, 1007.
Iidem and THOMPSON, J. W., *Amer. J. Physiol.*, 1938, **123**, 51.
DAVIS, P. A., *Dis. Nerv. Syst.*, 1941, **2**, 77.
DOUST, J. W. LOVETT, and SCHNEIDER, R. A., *Brit. Med. J.*, 1952, i, 449.
FIRSTBROOK, J. B., *ibid.*, 1951, ii, 133.
FREYHAN, F. A., WOODFORD, R. B., and KETY, S. S., *J. Nerv. Ment. Dis.*, 1951, **113**, 449.
GIBBS, F. A., and DAVIS, H., *Amer. J. Physiol.*, 1935, **113**, 59.
GREENBLATT, M., *Amer. J. Psychiat.*, 1944, **101**, 82.
HOCH, P., and KUBIS, J., *ibid.*, 1941, **98**, 404.
KETY, S. S., WOODFORD, R. B., HARMEL, H. M., FREYHAN, F. A., APPEL, K. E., and SCHMIDT, C. F., *ibid.*, 1948, **104**, 765.
LIBERSON, W. T., and SEGUIN, C. A., *Psychosomat. Med.*, 1945, **7**, 30.
MUNDY-CASTLE, A. C., *E.E.G. Clin. Neurophysiol.*, 1951, **3**, 477.
SAUL, L. H., DAVIS, H., and DAVIS, P. A., *Trans. Amer. Neurol. Assoc.*, 1937, **63**, 167.
Iidem, *Psychosomat. Med.*, 1949, **11**, 361.

Part II.—Reviews

Psychanalyse de L'Artiste et de son Oeuvre. (Psychoanalysis of Artists and Their Work.) By N. N. Dracoulides. Geneva: Mont-Blanc, 1952.

This is a psychoanalyst's approach to art, hence the author insists that the art critic should possess a psychoanalytic knowledge. No new view-point is offered. In each work of art, states the author, there is a latent meaning, not unlike in dreams. If this latent content is absent, art loses its true meaning. The basic impulse of creativity is an unfulfilled (generally sexual) desire, and the basic mechanism of creativity is sublimation. Thus art is a reflection of the psychological conflicts of the individual; should these conflicts be identical with those of a nation, we speak of national art.

The author accepts wholeheartedly the psycho-analytical ideas regarding the basically pathological nature of cultures. Hence his viewpoint on art is oversimplified, and his diagnosis of our own cultural conflicts naïve. He illustrates his standpoint by reminding the reader of the paintings of Bosch, and recalling the ideas of the existentialists. The pictorial illustrations range from paleolithic sculptures to the "Femme Phallique" of Dali; he also reproduces a rather obscene drawing of one of his patients.

The bibliography consists of 126 references, followed by a very carefully arranged index. F. Reitman.

Annual Review of Psychology. Volume Three. Edited by C. P. Stone. Stanford, California: Annual Reviews Inc., 1952, Pp. 462.

The editor points out that this is the first volume in this series on Psychology to include chapters by European psychologists, i.e., H. J. Eysenck of the Maudsley Hospital and J. Elmgren of Copenhagen.

Chapters are devoted to Child Psychology, Learning, Vision, Hearing, Someothesis and the Chemical Senses, Individual Differences, Personality, Social Psychology and Group Processes, Industrial Psychology, Comparative and Physiological Psychology, Abnormalities of Behaviour, Clinical Methods, Counselling, Educational Psychology, Statistical Theory and Research Design and Motivation.

One of the best chapters in the book is that on personality by Eysenck. He rightly draws attention to the tendency of so many writers on personality to emphasize environmental and minimize hereditary factors. The Russian attitude to the genetic side shows how far astray the research worker may be led. It is a pity that passages in a foreign tongue are included; a translation would be so much simpler. Instances of meaning are so important in psychology that it would be wiser than leaving the English-speaking reader to guess at the meaning; the British are notoriously weak in languages!

Another chapter which will interest our readers is that on Abnormalities of Behaviour by Zubin. He divides this up into four parts dealing with psychosurgery, shock therapy and avitaminosis, etc., behavioral accompaniments of life stress and behavioral accompaniments of genetically determined disorders.

Altogether a most satisfactory volume. G. W. T. H. Fleming.

Personality and the Frontal Lobes. By Asenath Petrie. London: Routledge & Kegan Paul, 1952. Pp. 188. Price 21*s*.

This is an excellent account of the personality changes which take place after different types of leucotomy in psychotics and neurotics. The types of operation dealt with are what may be called the posterior standard leucotomy, and anterior rostral leucotomy, unilateral and bilateral. The changes were assessed by psychometric methods, statistically dealt with. The tests were carried out three months after leucotomy and again after nine months; it would have added greatly to the value of the work if the tests had been repeated again five years after leucotomy—perhaps they may yet be ?

Generally speaking the author found a decrease in neuroticism and in introversion in both types of operation, but there was less impairment of intelligence after the rostral operation, although this operation was less successful than the standard operation when viewed from the clinical angle. We do not agree with the author's statement that a schizophrenic is already permanently altered by the illness. A proportion of schizophrenics recover completely and never relapse, so that they cannot be said to be "permanently altered by the illness."

The book is a good example of how a piece of research should be carried out, and we look forward to further studies amplifying the results described in this book.

G. W. T. H. FLEMING.

A History of Philosophy. By FRANK THILLY. Revised by LEDGER WOOD. London: George Allen & Unwin Ltd. Pp. 658. Price 40s.

This book, written primarily for the student of philosophy, can be regarded as a valuable reference book for the philosophically minded psychiatrist with an interest in the fundamental problems of existence, and the answers which the human race has sought to find for them at the various stages of civilization. The original edition was written in 1914 by Professor Frank Thilly, and this edition has been revised and brought thoroughly up to date by Professor Ledger Wood, Professor of Philosophy, Princetown University. The first two parts of the book deal with Greek and Medieval Philosophy respectively, while the third and longest deals with Modern Philosophy. Professor Ledger Wood draws attention to the clarity and simplicity of his predecessor's style, and to the sense of proportion which he displayed in his presentation of thinkers in their place in philosophical movements, and these are certainly notable features of the present edition. If his reading brings the psychiatrist up against references to philosophical theories with which he would fain refresh his memory, this History will give him a clear, succinct account of the theory in question, whether it be as ancient as that of Socrates or as recent as the neo-realism of Bertrand Russell or modern Existentialism the philosophy of disillusion and despair with its persistent preoccupation with death and the inevitability of recurrent crises leading to ultimate shipwreck and nothingness. All bibliographies have been brought up to date, and the author points out that, compared to the original edition, the relative number of French and German tables has been considerably reduced.

P. K. MCCOWAN.

The Perception of the Visual World. By JAMES J. GIBSON. U.S.A.: Houghton Mifflin Company, 1950 (George Allen & Unwin, Ltd., London). Price 35s.

This is an important book. The author is concerned only with the visual perception of space, and with the psychophysics of the problem rather than the psychophysiology.

He rejects orthodox theories that perception depends on past stimulation and memory, as well as on immediate stimulation ; and also the Gestalt theory that it depends on sensory organization. He substitutes the hypothesis that there is always some variable in immediate stimulation which corresponds to, or correlates with, every property of the spatial world. If he is right, and he produces a good deal of evidence to suggest that he is, much of the controversy which has taken place on the subject will be seen to have been irrelevant.

The book is very well produced, with some remarkable photographs which alone make the volume worth possessing. It also contains a large number of clear and expertly drawn diagrams. Besides being an important contribution to psychological theory, Dr. Gibson's book will also be valued as a source of information and illustrations for students and lecturers alike.

RALPH HETHERINGTON.

The Educability of Cerebral Palsied Children. By M. I. DUNSDON. Publication No. 4, National Foundation for Educational Research. London: Newnes Educational Publishing Co., Ltd., 1952. Price 21s.

This book reports a thorough and much-needed investigation into the possibilities of educating cerebral palsied children, and is, in fact, the first objective study of its kind to be made in this country. Some 3,700 children were included in the research, with ages ranging from birth to the end of their sixteenth year.

Miss Dunsdon finds that intellectual superiority is rare among cerebral palsied children, and that intellectual inferiority is found in a high proportion of cases. As might be expected, mental subnormality is associated to some extent with physical disability. She considers that verbal tests of intelligence are as adequate for these children as non-verbal tests.

It is interesting to note that visual and hearing defects are present in a large proportion of the children. Emotional lability is a common characteristic of cerebral palsy, and frank instability is frequently found.

In discussing educational possibilities she stresses three points, namely minimum desirable intelligence, minimum age, and extent to which physical treatment should be given, concurrently with formal education. In selecting children for educational schemes, Miss Dunsdon says that mental ability alone is not a sufficient criterion, and education must be thought of as concerned with every type of development, social and personal as well as scholastic, and motor as well as mental.

Educational care for such children should be planned on an estimated incidence of 1 per 1,000 in England and Wales. Social and motor training should take precedence over more formal education, and the latter should in any case not be attempted with children having intelligence quotients of less than 85.

Miss Dunsdon appreciates that her findings are not altogether encouraging; but she points out that it is better to realize the limiting conditions within which a scheme, to be successful, will need to be planned. This book will be read with interest by all those concerned with this particular problem, as well as by many others, and she is to be congratulated on the clearness with which her results are presented. The only deterrent for the ordinary reader will be the high price of the book, for which, however, we cannot blame the author.

RALPH HETHERINGTON.

Brain and Thought. By JEAN LHERMITTE. Paris: Bloud & Gay, 1951. Pp. 200–205.

Lhermitte, not greatly impressed but stimulated by papers at a London Symposium on the mind-body problem, sets out to review critically this problem in the light of present-day knowledge. He reports on some recent findings on cerebral structure and physiology considered relevant to the problem, and proceeds to give a detailed analysis of facts and theories arising from the studies on the bioelectrical activity of the C.N.S. The flicker phenomenon, scanning and feedback are discussed. Bio-electrical findings, together with clinical experience, suggest a subcortical regulation of cortical activity, a synchronization of cortical discharges by the thalamo-hypothalamic complex. There is, however, no definite correlation between mental activity and alpha waves and the gap between mind and matter remains as wide as before. The analogy which has been postulated between brain activity and calculating machines can, according to Lhermitte, only apply to the tools of the intelligence, not to the intelligence itself. There are also objections to explaining remembering by reverberating circuits which are supposed to replace the old trace theory; isolated experiences are frequently best remembered—an observation which does not fit into a theory of reverberating circuits. A special chapter deals with the problems of consciousness to which Lhermitte has made many outstanding contributions. Consciousness and self-consciousness, closely connected with personality, are considered by Lhermitte the central problem in the mind-body relations. Although it has been proved that the region of the hypothalamus can transform the state of consciousness, there is no evidence for regarding any particular brain area as the site of consciousness or of personality. The same applies to intelligence. The view, previously held, of a centre of intelligence in the frontal lobes has not been supported by experience of lobotomy and lobectomy. The frontal lobe activity consists of a regulation and modulation of cortical neurones; frontal lobotomy permits remodelling the psychotic to a normal personality.

The book ends on a pessimistic note with the statement that the fundamental problem of the specific human quality of mental processes in relation to brain activity is as far from a solution as at the times of Aristotle. The distinguished French author, whilst remaining doubtful as to progress in the mind-body problem as a whole, gives an excellent presentation of many minor problems, informative as well as stimulating.

R. KLEIN.

Textbook on Psychiatry. By EUGEN BLEULER. Translated by A. A. BRILL. U.S.A.: Dorer Publication, Inc. Pp. 672, with 51 illustrations. Price $7.50.

This reprint of Bleuler's classical textbook is very welcome, as the original translation published in 1923 is difficult to obtain. Although practically thirty years have elapsed since its appearance, this book has lost nothing of its value and to the modern psychiatrist it will prove to be a most welcome tonic. Since it was written before the days of insulin, electric shock or leucotomy, the sections on treatment lack the modern look, but the clinical descriptions have never been bettered and sound to us as good now as they did thirty years ago.

Dr. Shatzky provides us with a brief biographical sketch and a list of some of his writings. G. W. T. H. FLEMING.

Part III.—Bibliography and Epitome.*

ACT. LUSO-ESPANOL. NEUR. PSIQUIAT.

VOL. X.	1951.
Leucotomy in Psychosomatic Disorders. *Sargant, W.*	247
Postanalytic Vision in Children. *de Moragas, J.*	260
Sympathetic Glossodynia. *Fernandes, B.*	272
Radiological and E.E.G. Diagnosis of Subdural Haematoma. *Peraita, P., and Alino, L.*	294
The Investigation of Possible Therapeutic Properties of the C.S.F. in E.C.T. Cases. *Castilla del Pino, C.*	304

VOL. XI.	1952.
The Mechanism of Conversion. *Sargant, W.*	1
Symmetrical Calcification of the Basal Ganglia Associated with a Traumatic Haematoma. *Obrador Alcalde, S., and Albert Lasierra, P.*	13
Late Results of Prefrontal Lobotomy. *Marti-Granell, A., and Usua Marine, J.*	56

ACTA NEUR. PSYCHIAT. BELG.

VOL. LII.	1952.
The Reticular Formation of the Brain-stem and the Physiology of Sleep. *Tersuolo, C.*	125
Familial Spasmodic Paraplegia, IV. *Appel, L., and Van Bogaert, L.*	129
Study on Myositis, IV. *Löwenthal, A.*	141
Wernicke's Encephalopathy. *Dagnelie, J., and Duret, R.-L.*	
Mental Anorexia. *Labbé, P. L.-A.*	164
An Electrophysiological Study of a Case of Aneurysm of the Anterior Cerebral Artery. *Thiry, S., and Gerebtzoff*	187
Chronaximetric Researches in Leprosy. *Radermecker, M. A.*	204
A Contribution to the Study of Medullary Angiomatosis. *van Reeth, P. C.*	249
Experience of a Year of Intracerebral Injections, Non-mutilating and Non-necrosing. *Abely, P.*	271
The Treatment of the Subacute Phase of Hemiplegia. *Leroy, A.*	281
New Observations on Schizoparalexia and Schizoparagraphia. *Bobon, J.*	286

ACTA. PSYCHIAT. NEUR. SCAND., SUPPM.

	1952.
Paralysis Agitans. *Mjönes, H.*	No. 54
Criticizing Review of the Concepts of the Neuro-muscular Lesions in Experimental Vitamin E Deficiency, etc.	No. 76
Epilepsy in Association with Intracranial Tumour. *Lund, M.*	No. 81

AM. J. MENT. DEF.

VOL. LVI.	APRIL, 1952.
A Symposium on Children with Mental and Emotional Disabilities. *McCandless, B., et al.*	674
Constancy of the I.Q. with Mentally Deficient Patients as Measured by the T.A.T. *Engle, T. L., and Hamlett, I. C.*	775
Distribution of Mental Retardation in an Urban School Population. *Mullen, F. A., and Nee, M. M.*	777
Psychotherapeutic Techniques Among the Mentally Deficient. *Menzel, M. Z.*	796
Individual Psychotherapy with Mentally Defective Individuals. *Sarason, S. B.*	803

---

* A number of extracts in this section are reproduced from *Chemical Abstracts*. To the Editors of this Journal we extend our grateful thanks.

AM. J. ORTHOPSYCHIAT.

VOL. XXII. APRIL, 1952.

A Differential Study of Psychopathic Behavior in Infants and Children. *Karpman, B., et al.* 223
The Educational and Therapeutic Implications in Working with Parent Study Groups, etc. *Barnes, M. J.* 268
Principles and Techniques in the Integration of Psychiatric Services in a Juvenile Court with a Community Youth Program. *Peck, H. B.* 277
The Search for Significant Concepts in a Study of Parent-Child Relationships. *Nowlis, V.* 286
Parent-Child Relationships. *Lasko, J. K.* 300
An Investigation of Parent-Child Relationships in Terms of Awareness, Identification, etc. *Cass, L. K.* 305
Social Structure and Interaction Processes in a Psychiatric Ward. *Caudill, W., et al.* 314
The Body Image of Schizophrenic Children following E.C.T. *Bender, L., and Keeler, W. R.* 335
Destructive Fantasies in Certain Learning Difficulties. *Sperry, B. M., et al.* 356
Middle-Class Fathers Occupational Role and Attitudes Toward Children. *Aberle, D. F., and Naegele, K. D.* 366
Significant Relationship between the Human Figure and the Machine in the Drawings of Boys. *Elkisch, P.* 379
Perceptual Development and the Drawings of Children. *Bell, J. E.* 386
Group Factors in Promoting School Children's Mental Health. *Scheidlinger, S.* 394

108

AM. J. PSYCHIAT.

VOL. CXI. MARCH, 1952

*The Psychological Response to ACTH, Cortisone, Hydro-Cortisone and Related Steroid Substances. *Rome, H. P., and Braceland, F. J.* 641
*Nor-Epinephrine-like and Epinephrine-like Substances in Psychotic and Psychoneurotic Patients. *Funkenstein, D. H., et al.* 652
Lipoproteins in General and Cerebral Arterio-sclerosis. *Simon, A., et al.* 663
Recent Biochemotherapeutic Developments in Psychiatry. *Sackler, M. D., et al.* 669
The First Travelling Psychiatric Clinic in Quebec. *Reed, G. E., and Silver, A.* 676
Sociological Motivations of Delinquency. *Tappan, P. W.* 680
*Parental Deprivation and the "Broken Home" in Dementia Praecox and other Mental Disorders. *Oltman, J. E., et al.* 685
The Application of Principles of Child Psychotherapy in Residential Treatment. *Krug, O.* 695

The Psychological Response to ACTH, Cortisone, Hydro-Cortisone and Related Steroid Substances.

It has become evident to everyone who has had experience with ACTH, cortisone and related agents that they are potent substances with widespread direct and indirect effects. The number of clinical conditions for which they are being used involves a large group of patients who are otherwise foredoomed at least to prolonged convalescence and incidentally to much psychologic trauma. Even though it is generally agreed that these agents are not a panacea, nevertheless the discovery of their clinical application is a large step forward in the progress of medicine. Like all advances this one is not without hazards. The clinical psychiatrist is required to be familiar with some of these, for many are within his sphere of competence. There are implications for the future of psychiatry that promise much. Here for the first time are agents that can modify ego defences without affecting consciousness. Here for the first time are agents that affect the vital physiologic buffers that have to do with adaptation. These facts bespeak clinical as well as theoretic potentialities for the long-awaited reunion of psychology and physiology.

(Authors' abstr.)

Nor-Epinephrine-like and Epinephrine-like Substances in Psychotic and Psychoneurotic Patients.

1. Sixty-three patients with elevated blood pressures who were routine admissions to the Boston Psychopathic Hospital were given a standardized dose of mecholyl intramuscularly. On the basis of their blood-pressure reactions to the drug during a stated observation period the patients could be divided into two groups: (1) Type A were those in which following the injection of the mecholyl the blood pressure remained below the pre-injection level throughout the observation period. (On the basis of previous experimentation this was interpreted as indicating excessive secretion of an epinephrine-like substance.) (2) Group B were those in which following the injection of mecholyl the blood pressure returned to the pre-injection level within the observation period. (On the basis of previous experimentation this was interpreted as indicating excessive secretion of a nor-

epinephrine-like substance.) When these two groups were compared in regard to two other variables, the maximum fall in blood pressure after mecholyl, and the area between the mecholyl reaction and the basal blood pressure, the difference between the types was found to be significant at better than the ·01 level.

2. Thirty-nine of 42 cases showing evidence interpreted as indicating excessive secretion of an epinephrine-like substance improved with electric shock therapy. In contrast to this, only 3 of 21 cases showing evidence interpreted as indicating excessive secretion of nor-epinephrine-like substance responded to electric shock. This was significant at better than the ·01 level.

3. The great majority of the cases interpreted as showing excessive secretion of an epinephrine-like substance were diagnosed as manic-depressive or involutional psychosis, whereas the majority of the cases interpreted as showing excessive secretion of a nor-epinephrine-like substance were diagnosed schizophrenia. The response to electric shock followed the automatic type rather than diagnostic category, as the majority of the schizophrenic patients who showed evidence interpreted as indicating excessive secretion of an epinephrine-like substance responded to electric shock therapy.

4. A discussion of the contrasting physiological effects of the two products of the adrenal medulla was made, and the suggestion was offered that the manic-depressive and involutional psychoses represent in man the counterpart of Cannon's fight-flight reaction in cats. (Authors' abstr.)

Parental Deprivation and the "Broken Home" in Dementia Praecox and Other Mental Disorders.

The incidence of parental deprivation and "broken homes" was found to be very similar among individuals suffering from dementia praecox, manic-depressive psychosis, alcoholic state, and "other psychoses," and in normal control subjects. However, it was significantly higher in psychoneurotics and psychopathic personalities. With respect to causes of deprivation, it was noted that mental illness constituted a significant source of parental deprivation in two groups only—dementia praecox and manic-depressive psychosis. Divorce, separation or desertion occurred most frequently in the parents of psychopathic personalities and psychoneurotics. Statistics concerning the age at which deprivation occurred and the parent lost did not exhibit any significant trend. There was apparent tendency for increased incidence of parental deprivation in schizophrenic patients whose illness occurred before the age of 20. The incidence of various types of psychiatric abnormalities was almost identical in the siblings of both deprived and non-deprived patients. The type of psychiatric illness in siblings paralleled that found in the hospitalized patients. It is concluded that the incidence of dementia praecox is unrelated to known external stresses or deprivations. These data lend further support to the etiological importance of heredo-constitutional factors in the development of the major psychoses. Dementia praecox is regarded as a biological deficiency disease based on heredoconstitutional factors. This concept should not lead to an attitude of therapeutic nihilism. (Authors' abstr.)

APRIL.

Some Reflections on the Development of Psychiatry in Germany. *Gaupp, R.*	721
The Role of Insight in Psychotherapy. *Reid, J. R., and Finesinger, J. E.*	726
Long-term Prognosis in Mental Illness. *Holt, W. L., jun., and W. M.*	735
An Inquiry into Eidetic Imagery with Special Reference to Visual Hallucinations. *Saltzman, S. S., and Machover, S.*	740
Some Observations on Treatment in the Terminal Phases of Hospitalization. *Gilmore, H. R.*	749
Narcotic Addicts in Chicago. *Haines, W. H., and McLaughlin, J. J.*	755
Acute Delirious Mania. *Jarvie, H. F., and Hood, M. C.*	758
The Psychological Differentiation of Organic Brain Lesions and their Localization by Means of the Rorschach Test. *Dörken, H., jun., and Kral, V. A.*	764
Behavioral Patterns in Early Meetings of Therapeutic Groups. *Frank, J. D., et al.*	771
A Specific Treatment for Neurovegetative Dystonia. *Cerulli, F.*	779

MAY.

Normal Vertebrate Behavior as a Cause of Human Trouble. *Brickner, R. M.*	801
A Short History of Psychosurgery. *Ramsey, G. V.*	813
*A Correlation of Lobotomy Results with Basic Reaction Types. *Johnson, O., and Ehrenberg, R.*	817
Transorbital Lobotomy. *Freeman, W.*	825
The Original Case-material of Psychoanalysis. *Goshen, C. E.*	829
An Evaluation of Post-electroshock Confusion with the Reiter Apparatus. *Summerskill, J., et al.*	835
Thyrotoxicosis following Electric Convulsive Treatment. *Bercel, N. A.*	839
*Succinyl-choline-iodide as a Muscular Relaxant in E.C.T. *Holmberg, G., and Thesleff, S.*	842
*Mechanism of Seizures Induced by DFP. *Bouzarth, W. F., and Himwich, H. E.*	874

A Correlation of Lobotomy Results with Basic Reaction Types.

As suggested by previous lobotomy studies, the grouping of patients by basic reaction types of emotional disturbance, graded according to severity, reveals a consistent and marked correlation between level of illness and the degree and rate of clinical and social recovery. Though this correlation exists throughout the continuum of degree of illness, all types of disintegrated schizophrenics tend to respond to lobotomy in a generally limited degree, and the groups of so-called " integrated " psychotics also tend toward a similar and more favourable reaction to the operation.

Similarly the speed of recovery after lobotomy correlates in high degree with severity of illness. The time required for recovery to the point of readiness for discharge from the hospital is on the average more than double for the " full schizophrenics " than for the integrated psychotics. The speed of recovery is not a function of the length of illness before operation.

A careful differentiation of all patients into two general groupings of those maintaining a basic integration of the self and those suffering from widespread schizophrenic disorganization demonstrates marked differences in rate and degree of clinical and social recovery. Thus 82 per cent. of the former group are symptom-free and have been discharged from the hospital, but only 8 per cent. of the latter were freed from psychosis and but 10 per cent. have been returned to the community.

Although less favorable results have been consistently reported by investigators for schizophrenic cases, the high recovery rate of 77 per cent. in a special classification of " schizophrenics with accompanying trends " suggests that the crucial factor in prognosis is not the presence of a schizophrenic process, but whether this illness has progressed to a stage of chronic and general personality disorganization marked by the persisting features of emotional dulling, loss of contact with people, widespread delusions, hallucinations and intellectual disintegration.

Of the total group of 71 lobotomized patients here considered, 30 per cent. recovered quite completely from their illness and have returned to the community. Another 13 per cent. is considerably improved but still institutionalized, and an additional 27 per cent. made a slight but significant gain in level of adjustment within the hospital. Nine per cent. are more ill after the operation than before. These results are comparable to those recorded elsewhere for similar groups of patients, but toward the lower end of the range of gains.

Despite the degree of recovery reported above, with an understandable emphasis on the criterion of discharge from the hospital, the post-operative progress of these patients toward personal independence and social effectiveness is limited, since two-thirds of those discharged are completely or partly dependent on others for economic support or supervision. Since the symptoms of previous illness have been generally removed in these cases, this impairment in personal efficiency seems due in considerable part to the frontal lobe deficit produced by lobotomy with the technique employed in the authors' cases.

(Authors' abstr.)

Succinyl-Choline-Iodide as a Muscular Relaxant in Electroshock Therapy.

Succinyl-choline-iodide has been used to produce muscular relaxation in 136 patients in connection with 512 electroshock treatments. A method is described in which the preparation is administered intravenously in a mixture with a rapidly acting barbiturate. The powerful and brief effect of succinyl-choline-iodide makes it possible to reduce the convulsions until they are practically negligible, without the risk of prolonged respiratory difficulties. Except for an insignificant vertebral fracture no serious complications were observed either during or after the treatments. In the opinion of the writers, succinyl-choline-iodide is particularly suitable for routine use in connection with electroshock therapy. (Authors' abstr.)

Mechanism of Seizures Induced by Di-Isopropyl Fluorophospahate (DFP).

A simple method for electrical recording from the caudate nucleus and thalamus in the rabbit was described.

The control tracings from the limbic cortex, motor cortex, caudate nucleus and thalamus consisted of aperiodic waves with a frequency of 5–7 per second and an amplitude of 200–300 microvolts. The motor area was interrupted with short bursts of higher amplitude spikes (8–12 per second).

DFP was capable of evoking seizure patterns in all four areas, and usually in the following order : (*a*) thalamus, (*b*) caudate nucleus, (*c*) limbic cortex, and (*d*) motor cortex.

The motor cortex had the highest threshold, and most frequently exhibited seizure waves when the other 3 areas were simultaneously engaged in hyperactivity. These facts suggested the necessity of a functional unity of the four cerebral areas for the participation of the motor cortex in seizures, and may also explain the aura that precedes the attack.

Simultaneous activity between the caudate nucleus and the motor cortex suggested functional connections between these two areas. For the same reason the thalamus and limbic cortex appeared to have a physiologic relationship.

Spike and dome patterns were observed, most frequently in the thalamus. In some animals thalamic *petit-mal*-like patterns developed into frank *grand-mal*-like spikes.

Depression of convulsant activity without apparent shock suggests the depressant effect of acetylcholine in a concentration greater than that required for hyperactivity. This offers theoretical evidence for central transmission of acetylcholine.

(Authors' abstr.)

JUNE.

An Evaluation of Glutamic Acid in Mental Deficiency. *Zabarenko, R. N., and Chambers, G. S.* . . . 881
Nicotinic Acid Therapy in Psychoses of Senility. *Gregory, I.* . . . 888
Lysergic Acid Diethylamine. *Savage, C.* . . . 896
A Criticism of the Concept of Neurotic Depression. *Ascher, E.* . . . 901
Constitutional Factors in the Prognosis of Schizophrenia. *Kline, N. S., and Oppenheim, A. N.* . . . 909
Movements of the Vocal Apparatus during Auditory Hallucinations. *Roberts, H. H., et al.* . . . 912
Medical and Legal Concepts of Criminal Responsibility. *Stokes, A. B.* . . . 915
An Unusual Response to the T.A.T. *Kaplan, H., et al.* . . . 918
Sleep Paralysis. *Schneck, J. M.* . . . 921
Rehabilitating Chronic Neuropsychiatric Patients. *Stringham, J. A.* . . . 924

AM. J. PSYCHOTHER.

VOL. VI. APRIL, 1952.

The Management of Borderline Schizophrenia. *Douglas, D. B.* . . . 245
A Rationale for Psychotherapy in Anxiety, Obsession and Depression. *Winokur, G.* 256
Conscious Secretiveness as a Masochistic Defense. *Grand H. G.* . . . 261

ANN. MED-PSYCHOL.

VOL. CX. 1952.

The Concept of Schizophrenia and it's Clinical Aspect. *Dimitrijevic D. T.* . . . 273
A Contribution to the Study of Tsedeck's Test. *Boisson G.*. . . . 401
Blood Eosinophilia in Neurosurgical Explorations. *Gros, C., et al.* . . . 521
Intra-cerebral Injections in Psychoses. *Guyot P.* . . . 547
A Projective Method for the Psychological Study of Primitive Populations. *Litler, V.-A.* . . . 565

ARCH. NEUR. PSYCHIAT.

VOL. LXVII. MARCH, 1952.

Tumors of the Medulla Oblongata. *Cooper, I. S., et al.* . . . 269
*Neuropsychiatric Aspects of Cushing's Syndrome. *Trethowan, W. H., and Cobb, S.* 283
Relative Effects of Occipital and Peripheral Blindness upon Intellectual Functions. *Levine J.* . . . 310
Effectiveness of Chordotomy in Phantom Pain after Amputation. *White, J. C., and Sweet, W. H.* . . . 315
Word Deafness and Wernicke's Aphasia. *Ziegler, D. K.* . . . 323
Lipids and Proteins of Plasma in Patients with Diseases of the Nervous System. *Fish, A. A., et al.* . . . 332
Experimental Chronic Epilepsy in the Monkey. *Kopeloff, L. M., et al.* . . . 336
Statistical Control in Neurology: II. *Savitsky, N., and Madonick, J. M.* . . . 344
Effects of Histamine on Cerebral Hemodynamics and Metabolism. *Alman, R. W., et al.* . . . 354
Electrical Recordings of Normal and Abnormal Eye Movements Modified by Drugs. *Bergman, P. S., et al.* . . . 357
*Effects of Subtotal Lesions of Frontal Granular Cortex on Delayed Reaction in Monkeys. *Blum, R. A.* . . . 375

Neuropsychiatric Aspects of Cushing's Syndrome.

The neuropsychiatric abnormalities observed in a series of 25 cases of Cushing's syndrome are described.

The significance of these findings, together with those of a number of other authors, is discussed, and a comparison is drawn between these abnormalities and those which sometimes occur as a complication of treatment with corticotropin and cortisone.

Emphasis is laid on the fact that, although mental disturbance may be severe, recovery from this, as well as from physical disabilities, is to be expected in a reasonable proportion of cases as a result of adequate surgery, which, it would seem, is the treatment of choice. Three of the four most severely disturbed patients in this series recovered as a result of such treatment.

The fall in the increased protein content of the cerebrospinal fluid after operation, which has also been observed, is thought to be a further indication of the reversibility of the abnormal cerebral function.

In certain cases full recovery may be delayed or prevented, owing to hypoadrenalism following operation, which may later be controlled, or possibly as a result of grosser or irreversible cerebral damage.

In addition, some possibly significant etiological factors are described, and an effort is made to relate these to the occurrence both of endocrine dysfunction and of mental symptoms. (Authors' abstr.)

Effects of Subtotal Lesions of Frontal Granular Cortex on Delayed Reaction in Monkeys.

Lesions of the dorsal, midlateral and ventrolateral parts of the frontal granular cortex and a composite of these ablations were made in a series of monkeys (*Macaca mulatta*).

The subjects were tested on an auditory discriminative habit and on delayed reaction to auditory and to visual cues.

The animals whose lesions were predominantly in the ventrolateral or dorsal region showed only comparatively slight deficits on the tests ; those whose lesions involved the midlateral portion were seriously handicapped on all tests. Among the latter group, total mass of tissue removed appeared to influence severity of symptoms.

Studies of thalamic degeneration were made, and the organization of the projection of nucleus medialis dorsalis is discussed. (Author's abstr.)

APRIL.

Abraham Lincoln's Organic and Emotional Neurosis. *Kempf, E. J.* 419
Chronic Psychogenic Hyperventilation. *Guze, S. B., et al.* 434
Evaluation of the Electromyogram of Patients with Myasthenia Gravis. *Botelho, S., et al.* 441
Hypothalamic Syndromes Complicating Antirabies Vaccination. *McFadyean, A. J. S.* 451
Trihexyphenidyl (Artane), Stramonium and Nonchemotherapy of Paralysis Agitans. *Berkowitz, B., and Alvermann, E.* 462
Experimental Cerebellar Seizures. *Johnson, H. C., et al.* 473
Ribosuria. *Orr, W. F., et al.* 483
*A Theory of Frontal Lobe Function. *Arnot, R.* 487
Cerebral Angiography with Iodopyracet Injection U.S.P. (Diodrast) *Tarlov, I. M., and Rosenberg, M.* 496
Effects of Frontal Lobotomy on the Morphine-Abstinence Syndrome in Man. *Wikler, A., et al.* 510
Effect of Epinephrine on Cortical and Basal E.E.G's. and the Eosinophile Count. *Gottschalk, L. A.* 522
Psychosomatic Aspects of Multiple Sclerosis. *Teitelbaum, H. A., et al.* 535
Expanding Concepts of Neurophysiology. *Brazier, M. A. B.* 545

A Theory of Frontal Lobe Function.

A theory of the function of the frontal lobes is offered which states that a function of the frontal lobes and their connections is to aid the persistence of emotional states, chains of thought, motor actions and motor inhibitions.

Support for the theory is found in clinical observation of patients before and after frontal lobotomy. States of worry, fear, depression, tension and negativism are relieved, while conditions of excessive intake of food, outspokenness, and lack of initiative are developed. Both the benefits and the deficits following lobotomy are considered to be evidences of the reduction of this persistence function.

Anatomical and physiological knowledge of the frontal lobes and their connections offers no contradiction to the present theory.

Psychological studies, indirectly and directly, offer support for the persistence theory. On the other hand they show that the frontal lobes do not have a function that can be measured by the routine psychological tests, which mostly show no significant changes after operation. On the other hand, they show that the studies which do delineate changes after lobotomy are those that measure manifestations of this persistence function—for, example, the tests for a decrease in prolonged attention used by Robinson. (Author's abstr.)

MAY.

Cell Rests in the Region of the Fourth Ventricle. *Brzustowicz, R. J., et al.* . . 585
Studies on Anxiety Associated with Anticipation of Pain. *Hill, H. E., et al.* . . 612
Combined Use of Ethyl Alcohol and Amytal Sodium for Ambulatory Narcoanalysis. *Miller, M. M.* 620

Incidence of Cavum Septi Pellucidi and Cavum Vergae in 1,032 Human Brains. *Schwidde, J. T.* 625
Occlusive Cerebrovascular Disease Simulating Brain Tumor. *Smiley, G. L.* . . 633
Subarachnoid Hemorrhage, Intracerebral Hemorrhage and Intracranial Aneurysms. *Dekaban, A., and McEachern, D.* 641
Rate of Advance of Hoffmann-Tinel Sign in Regenerating Nerves. *Sunderland, S., and Bradley, K. C.* 650
*Clinical and E.E.G. Effects of Prefrontal Lobotomy and Topectomy in Chronic Psychoses. *Krueger, E. G., and Wayne, H. L.* 661
Reactions of Dogs without Neocortex during Cycles of Addiction to Morphine and Methadone. *Wikler, A.* 672

Clinical and Electroencephalographic Effects of Prefrontal Lobotomy and Topectomy in Chronic Psychoses.

The clinical and electroencephalographic observations following topectomy or lobotomy in a group of 105 patients with chronic psychoses are presented. Comparison of the rate of clinical improvement for 62 lobotomies with that for 19 topectomies in patients with chronic advanced schizophrenia showed a considerably lower value for the topectomy group. It is assumed that this discrepancy is based on the greater severity and chronicity of the psychopathologic process in their case material.

Lobotomy after ineffectual topectomy produced significant improvement in three of seven patients.

The theoretical implications of their clinical results are discussed with regard to similar observations in the literature, the evidence supporting a quantitative principle underlying the mechanism on which the clinical improvement following psychosurgery may be based.

The electroencephalograms in the early stage following prefrontal lobotomy, and topectomy showed severe cortical damage in the form of either a diffuse or a focal slow-wave abnormality. The defects were severer after lobotomy than after topectomy.

The brain-wave patterns of many patients who underwent lobotomy or topectomy reacted differently to sedatives, particularly barbiturates, than before operation. At this time no definite explanation can be given for this observation, and it should be further investigated.

So far, about 30 per cent. of their lobotomy patients show proneness to the development of seizures, whereas only one-third of the patients with paroxysmal patterns had clinical seizures at the time of their examination. Eight (42 per cent.) of 19 topectomized patients have now had one or more clinical seizures, while only two had shown seizure patterns shortly after the operation.

Normal sleep spindle activity is more impaired in patients who have undergone prefrontal lobotomy than in patients who have undergone topectomy.

The difference in the electroencephalographic pattern following lobotomy and that following topectomy is in accordance with the clinical experience that lobotomy constitutes a more radical procedure than topectomy. (Authors' abstr.)

ARCH. PSICOL. NEUR. PSICHIAT.

VOL. XIII. 1952.

Eighth Congress of Piedmont-Liguria-Lombardy Section of Italian Neurological Society 2
A Contribution to Criticism of Szondi's Test. *Massucco Costa, A., and Remondino, C.* 153
The "Bunch of Grapes Test" in a Group of Normal Subjects. *Sanguineti, I., and Sigurta, R.* 198
Results of the Application of the "Bunch of Grapes Test" to a Group of Soldiers. *Treves, G., and Papo, I.* 217
The Relationship of Psychology to Psychiatry. *Gozzano, M.* 257
Animal Psychology in General Psychology. *Zunini, G.* 273
Neurology and Psychiatry. *Morselli, G. E.* 284
The Wechsler-Bellevue Test Applied to Sixty Schizophrenics. *Roi, G.* . . . 324

ARQ. DEPT. PSICOPAT. SAO PAULO.

VOL. XVI. 1951.

The Physiopathology of the Frontal Lobe in the Light of Prefrontal Leucotomy. *Pimenta, A. M., et al.* 5
Anatomo-physiology in the Light of Lobotomy and Topectomy. *Yahn, M.* . . 9
Pre-frontal Leucotomy in Children and Adolescents. *Yahn, M., and Krynski, S.* . 15
Psychopathological Art at the First International Congress in Paris. *Yahn, M.* . 23
Degenerative Psychoses of Kleist in the Light of Human Genetics. *Robortella, M.* . 33
The Physiopathology of the Orbital Lobe in Relation to Leucotomy. *Vizzotto, S., and Pimenta, A. M.* 39
A Contribution to the Study of Art in the Insane. *Cesar, O.* 51

ARQ. NEURO-PSIQUIAT.

VOL. X. MARCH, 1952.

Neurological Changes in Achylic Deficiency Diseases. *Canelas, H. M.* 1
Human Genetics as an Approach to the Classification of Mental Diseases. *Silveira, A.* 41
Primary Demyelinization of the Central Nervous System. *Aidar, O.* 47
Demyelinating Diseases of the Nervous System. *Lefevre, A. B., et al.* 57

BRAIN.

VOL. LXXV. JUNE, 1952.

Disturbances of Consciousness with Lesions of the Brain-stem and Diencephalon. *Cairns, H.* 109
A Critique of "Suppression" with Additional Observations in the Cat. *Druckman, R.* 226
Functions of the Orbital Gyri of Cats. *Hess, W. R., et al.* 244
Casts of the Ventricles of the Brain. *Woollam, D.* 259

BRIT. J. EDUC. PSYCHOL.

VOL. XXII. JUNE, 1952.

Symposium on Psychologists and Psychiatrists in the Child Guidance Service: IV. *McCallum, C. M.* 79
The Influence of Home Environment on the Educational Progress of Selective Secondary School Children. *Campbell, W. J.* 89
Radio Preferences of Adolescents and Children. *McKellar, P., and Harris, R.* 101
The Language Handicap of Welsh-speaking Children. *Jones, W. R.* 114
The Prognostic Value of the University Entrance Examination. *Dale, R. R.* 124
The Local Education Authority and Educational Research. *Meiklejohn, J.* 140

BRIT. J. PSYCHOL.

VOL. XLIII. MAY, 1952.

The Effects of Epanutin and E.C.T. on the Maze Performance of Rats. *Broadhurst, P. L., et al.* 85
The Vigotsky Test as a Measure of Intelligence. *Semeonoff, B., and Laird, A. J.* 94
The Word Connection List as a Diagnostic Test. *Crown, S.* 103
An Experimental Investigation of the Absolute and Relative Theories of Transposition Behaviour in Children. *Hunter, I. M. L.* 113
Happiness and Unhappiness in the Childhood and Adolescence of a Group of Women Students. *Barschak, E.* 129
Some Correlates of Opinions on the Upbringing of Children. *Shapiro, M. B.* 141

BULL. LOS ANGELES NEUR. SOC.

VOL. XVII. MAY, 1952.

The Structure and Connections of Neurons. *Ramón y Cajal, S.* 5
Cajal the Philosopher as Revealed by his Literary Works. *Sanchez-Perez, J. M.* 47
Ramón y Cajal's Gross Physiological Conceptions of Memory, Attention and Sleep. *Nielsen, J. M.* 54
The Role of the Astrocyte in the Formation of Cerebral Scars, etc. *Rand, C. W.* 57
Traumatic Alterations in the Neurone of the Human Brain Incident to Craniocerebral Injury. *Courville, C. B.* 71

CERVELLO.

VOL. XXVIII. 1952.

Psychopathological Symptoms in the Sublimation of Art. *Niceforo, A.* 161
The Association of Hypersomnia and Bulimia. *Sagripanti, P.* 194
Glycemic Variations in the Intraspinal Introduction of Glucose Solution in Normal and Diabetic Psychotic Subjects. *Dogliani, P., and Campi, L.* 207
Transorbital Prefrontal Leucotomy. *la Loggia, M.* 216

CONF. NEUR.

VOL. XII. 1952.

Disseminated Demyelinating Process of Over 50 Years' Duration. *Riese, W., et al.* 113
Studies in Stereoencephalotomy: I. *Spiegel, E. A., et al.* 121
A New Experimental Investigation of the Blood-C.S.F.-Barrier. *Grinschgl, G.* 133
Mescaline and Lysergic-diethylamide Intoxication. *Matefi, L.* 146

DIS. NERV. SYST.

VOL. XIII. MARCH, 1952.

Hypnosis in the Treatment of Traumatic Neurosis. *Dane, P. G., and Whitaker, L. H.* . . . 67
Variability of Deterioration in Schizophrenia. *Levy, S., and Southcombe, R. H.* . 76
Group Psychotherapy in Reverse. *Klapman, J. W.* . . . 81
Treatment of the Homosexual in Prison. *Haines, W. H., and McLaughlin, J. J.* . 85
Hibicon. *Kaplan, L. A., and Maslanka, S.* . . . 88

APRIL.

Therapeutic Effects of ACTH in Myotonia Dystrophica. *Reese, H. H., and Peters, H. A.* . . . 99
Effect of Glutamic Acid on Chronic Psychotic Patients. *Pile, W. J.* . . . 106
Probability of Relapse in Dementia Praecox. *Danziger, L.* . . . 111
Pregnancy in Lobotomized Schizophrenia. *Eliasberg, W. G.* . . . 116

MAY.

Differential Diagnosis of Epilepsy and Hysteria. *Tucker, I. M., and Greenblatt, M.* 131
Treatment of Psychopathic Personality by Transorbital Leucotomy. *Whalen, J. F., et al.* . . . 136
Hypnotic Investigation and Relief of Reccurrent Anxiety Episodes. *Schneck, J. M.* 142
Schizophrenia in the Period of Involution. *Bychowski, G.* . . . 150

E.E.G. CLIN. NEUROPHYSIOL.

VOL. IV. FEBRUARY, 1952.

*Suppression-burst Activity from Isolated Cerebral Cortex in Man. *Henry, C. E., and Scoville, W. B.* . . . 1
E.E.G. Findings in Posterior Fossa Tumors. *Bagchi, B. K., et al.* . . . 23
E.E.G. and Clinical Findings in Twenty-eight Verified Cases of Brain Abscess. *Ziegler, D. K., and Hoefer, P. F. A.* . . . 41
The Localizing Value and Significance of Minor Differences of Homologous Tracings as Shown by Serial E.E.G. Studies. *Aird, R. B., and Adams, J. E.* . . . 45
On the Relationship between Reaction Time to Light and Latency of Blocking of the Alpha Rhythm. *Stamm. J. S.* . . . 61
*E.E.G. Changes after Hyperventilation and Psychoton (Benzedrine Sulphate) in Epileptics. *Serel, M., et al.* . . . 69
*An E.E.G. Study of the Antagonism between Metrazol and Sodium Amytal. *Kirstein, L.* . . . 73
Induced Fast Activity in the E.E.G. as an Aid in the Location of Cerebral Lesions. *Pampiglione, G.* . . . 79
An Electronic Trigger used to Assist in the E.E.G. Diagnosis of Epilepsy. *Turton, E. C.* . . . 83

Suppression-burst Activity from Isolated Cerebral Cortex in Man.

1. Direct electrical recording from the cortex of man has been carried out on 34 patients, before, throughout and following prefrontal lobotomy. Operations were done under local as well as Pentothal anesthesia, and included the classical or standard "open" prefrontal lobotomy and surgical isolation by undercutting of both superior convexity (partial Brodmann areas 9 and 10) and orbital surfaces. The pial circulation was preserved in all cases.

2. All cases showed a marked decrease in electrical activity from cortex rostral to the section, and all but one showed the development of bursts of fast activity alternating with quiet sections of record. Such bursts were usually superimposed on or followed by high voltage very slow delta activity.

3. This suppression-burst activity was confined to isolated cortex, and was not seen from leads lateral and posterior to such cortex. It was characteristically asynchronous from right and left sides.

4. Suppression-burst activity, as judged from its continued presence at the time of repeat operation, persisted for over a year in the electrogram of undercut cortex, but was not detected in the scalp E.E.G.

5. Suppression-burst activity while resembling the patterns of barbiturate bursts, does not depend on barbiturate or other anesthesia, for it developed in characteristic form in cases operated under local anesthesia.

6. This pattern is probably analogous to that seen in cats following lesions to the basal diencephalon. It is possibly related to the release of cortex from the influence of the reticular activating system.

7. Some of the literature dealing with the relative role of cortex and thalamus is reviewed. It is concluded that there is autochthonous electrocortical activity, and that reverberating thalamo-cortical circuits are not necessary for the maintenance of such activity. (Authors' abstr.)

Electroencephalographic Changes after Hyperventilation and Psychoton (Benzedrine-Sulphate) in Epileptics.

Comparison of Psychoton (benzedrine) activation with hyperventilation activation in 90 epileptics is presented. Psychoton produces less activation than hyperventilation. After administration of Psychoton 28 per cent. out of 90 patients became active. After hyperventilation activation occurred in 43 per cent. We have grouped the changes into three categories as follows: diffuse dysrhythmia bilaterally synchronous, focal abnormalities and paradoxical reactions. Four patients had characteristic 3/sec. wave and spike diffuse dysrhythmia. Psychoton may be indicated in cases where hyperventilation is not satisfactory. Contraindications include the danger of producing a clinical epileptic attack such as occurred in six of the authors' patients. (Authors' abstr.)

An Electroencephalographic Study of the Antagonism between Metrazol and Sodium Amytal.

The effect of metrazol on the barbiturate activity of the brain was studied in 18 experiments on 15 subjects. Metrazol completely removed the slow activity; the fast activity was either diminished or unchanged. The effect produced by metrazol may be interpreted as increased interneuronal activity evoked by the drug. (Author's abstr.)

MAY.

Response of Experimental Epileptic Foci to Intravenous and Topical Metrazol. *Johnson, H. C., and Walker, A. E.* 131
Effect on the Electrical Activity of the Brain of Intra-arterially and Intra-cerebrally Injected Convulsant and Sedative Drugs. *Shimizu, K., et al.* 141
Paroxysmal High Voltage Discharges from Isolated and Partially Isolated Human and Animal Cerebral Cortex. *Echlin, F. A., et al.* 147
The E.E.G. Findings in Eighteen Patients with Brain Abscess. *Pini, I., et al.* . 165
*E.E.G. Findings in a Certain Type of Psychosomatic Headache. *Weil, A. A.* . 181
Influence of Sleep on Focal Slow Wave Activity, Correlation with Epileptogenic and Non-epileptogenic Lesions. *Grossman, C., et al.* 195
Cross Correlation and Autocorrelation Studies of E.E.G. Potentials. *Brazier, M. A. B., and Casby, J. A.* 201

E.E.G. Findings in a Certain Type of Psychosomatic Headache: Dysrhythmic Migraine.

An electroencephalographically recognizable type of migraine has been described in 8 subjects.

Although the E.E.G. abnormalities varied, high voltage, slow paroxysms were noted in all records and all tracings could be easily activated by hyperventilation.

Besides the common findings of "ordinary" migraine, aphasic episodes and attacks of syncope were frequent.

Anticonvulsant medication benefited these patients, quite in contrast to "ordinary migraine."

Psychodynamic factors appear of maximum importance, and should be considered in all patients afflicted with true migraine associated with definite E.E.G. abnormalities.

Should the author's findings in this small group of subjects be confirmed by other investigators, then the term "dysrhythmic migraine" for this loosely connected syndrome is submitted for consideration. (Author's abstr.)

ENCEPH.

VOL. XLI. 1952.

The Treatment of Mental Illness by Prolonged Hypoglycemic Comas and Spontaneous Recovery without Administering Carbohydrate. *Seggiaro, J.-A., and Machado, M.-R.* 97
Treatment and Evolution of Hypoglycemic Coma. *Seggiaro, J.-A., and Machado, M.-R.* 108
Art in Mental Illness. *Bergeron, M., and Volmat, R.* 143
E.E.G. in Cerebral Tumours with Mental Symptoms. *Delay, J., et al.* . . . 217
Experimental Work on the Clinical Application of Szondi's Test. *Kobler, A.-L.* . 234
Psychological and Therapeutic Perspectives Offered by Intermittent Light Stimulation *Faure, J.* 243
Subacute Necrotic Myelitis. *Van Reeth, P. C.* 289

EVOL. PSYCHIAT.

VOL. XXIII. 1952.

Present-day Psychopathology of the Human Being. *Minkowski, E.* 1
Psychic Epilepsy and the Temporal Lobe. *Alliez, J.* 21
Theories of Suicide. *Deshaies, G.* 41
The Waking Dream of Robert Desville. *Van den Berg, J. H.* 55

FOL. PSYCHIAT. NEUR. NEUROCHIR. NEDERL.

VOL. LV. 1952.

The Psychology of Pessimism. *Janse de Jonge, A. L.* 20
Spina Bifida Occulta, a Normal Feature in all Birds. *Jelgersma, H. G.* . . . 42
Pulsating Exophthalmos and von Recklinghausen's Disease. *Elslo, F. L., and v. d. Zwan, A.* 51
The Syndrome of Occlusion of the Internal Carotid Artery. *Askenasy, H., and Wijsenbeek, H.* 55
The Fundamental Problem and Psychotherapeutic Treatment of Psychosomatic Illness. *Prick, J. J. G., and Calon, P.* 129
Electrophoresis in Cerebrospinal Fluid Proteins. *Booy, J.* 137
Silence. *Versteeg-Solleveld, C. M.* 150
Drinker Types. *Esser, P. H.* 161

GENET. PSYCHOL. MONOGR.

VOL. XLV. FEBRUARY, 1952.

Japanese-American Personality and Acculturation. *Caudill, W.* 3

GIORN. PSICHIAT. NEUROPAT.

VOL. LXXX. 1952.

Variations in Circulation Velocity and in Venous Pressure in Alterations of Muscular Tone. *Mucio, G., and Mannironi, G.* 1
Transcerebral Electrotherapy of Low Intensity in Psychiatric Practice. *Riboli, B.* . 21
A Peculiar Heredo-degenerative Spino-cerebellar Sequence. *Linsso, A. G. B.* . 37
Cerebral Arteriography. *Govoni, A., and Englaro, G.* 71

IND. J. NEUR. PSYCHIAT.

VOL. III. 1951.

Schizophrenia. *Johnson, A. S.* 1
Glutamic Acid in Mental Deficiency. *Kale, B. S.* 12
Brief Stimulus Therapy. *Varma, L. P.* 22
Common Obsession Compulsion. *Roy, P. K.* 35
Mental Diseases in General Practice. *Davis, R. B.* 40

INTERNAT. J. PSCHOANAL.

VOL. XXXIII. 1952.

A Contribution to the Revaluation of the Oedipus Complex. *Heimann, P.* . . 84
Early Anxiety Situations in the Analysis of a Boy in the Latency Period. *Evans, M. G.* 93
Notes on the Psychoanalysis of the Super-ego Conflict of an Acute Schizophrenic Patient. *Rosenfeld, H.* 111
Clinical Notes on Internalization and Identification. *Munro, L.* 132
An Obsessional Man's Need to be " Kept." *Sandford, B.* 144
Examination Anxiety without Examination. *Thorner, H. A.* 153
The Unconscious Phantasy of an Inner World Reflected in Examples from English Literature. *Riviere, J.* 160
The Inner World in Ibsen's Master Builder. *Riviere, J.* 173
Aspects of Symbolism in Comprehension of the Not-Self. *Milner, M.* . . . 181
A Psycho-analytical Approach to Aesthetics. *Segal, H.* 196
Preliminary Notes on Some Defence Mechanisms in Paranoid States. *Heimann, P.* 208
New Beginning and the Paranoid and Depressive Syndromes. *Balint, M.* . . . 214
Psychoanalysis and Ethics. *Money-Kryle, R. E.* 225
Group Dynamics. *Bion, W. R.* 235

J. AB. SOC. PSYCHOL.

VOL. XLVII. JANUARY, 1952.

Projective Techniques on the Doorstep. *Sanford, F. H., and Rosenstock, I. M.* . 3
On a Behavioristic Approach to the Concept of Wish-fulfilment. *Seemen, W., and Buck, R.* 17
Memory for Socially Relevant Material. *Alper, T. G., and Korchin, S. J.* . . 25
Stuttering Behavior and Anxiety as a Function of the Derivation of Stimulus Words. *Goss, A. E.* 38
The Relative Abilities of Leaders and Non-leaders to Estimate Opinions of their Own Groups. *Chowdhry, K., and Newcomb, T. M.* 51

On the Persistence of an Ear-scratching Response in the Rat. *Datel, W. E., and Seward, J. P.* 58
A Measure of "Homelessness." *Elias, G.* 62
The Effect of Hunger on Discriminated Responding. *Dinsmoor, J. A.* 67
A Personality Scale for Social Responsibility. *Gough, H. G., et al.* 73
Generalization of Perceptual Response. *McGinnies, E., and Sherman, H.* 81
On the Personality Structures of Schizophrenics. *Winder, C. L.* 86
Parent-child Relationships and Delinquency. *Cass, L. K.* 101
Ethnocentrism and Anti-negro Attitudes in the Deep South. *Prothro, E. T.* 105

J. BRAS. PSIQUIAT.

VOL. I. 1952.

Abdominal Epilepsy. *Moore, M. T.* 5
Human Consciousness and Animal Consciousness. *Nobre de Melo, A. L.* 33
Clinical Subdivision of the Schizophrenias. *Lewis, A.* 145
The Steroids of the Adrenal Cortex in Psychiatry. *Ferreira, A. C.* 157

J. CLIN. EX. PSYCHOPATH.

VOL. XII. 1951.

Endocrinologic Orientation to Psychiatric Disorders. *Van Ophuijsen, J. H. W., et al.* 1
Electromyographic Studies of Muscular Tension in Psychiatric Patients under Stress. *Malmo, R. B., et al.* 45
The Social Psychopathology of the Schizophrenic States. *Rud, F.* 67
Suicide. *Farrar, C. B.* 79
*Significance of the Thalamus in Psychoses. *Bateman, J. F., and Papez, J. W.* 89
*Some Biochemical Considerations of Psychotic Behavior. *Hoagland, H.* 111
*Effects of Factors that Modify Cerebral Bloodflow on Hallucinations in Schizophrenia. *Altschule, M. D.* 123
*Comparison of Decamethonium Bromide and D-Tubocurarine as Preventives of Traumatic Complications in E.C.T. *Bennett, A. E., et al.* 130
Diagnosis, Psychodynamics and Treatment. *Katzenelbogen, S.* 143
Graphic Art as a Special Ability in Children with a Reading Disability. *Bender, L., and Schilder, P.* 147
Experimental Abridgement of the Rorschach Test. *Valentine, M.* 157
Adrenocortical Responsivity in Relation to Psychiatric Illness and Treatment with ACTH and E.C.T. *Reiss, M., et al.* 171
The Effect of ACTH, Cortisone, Hydrocortisone and Related Steroids on Mood. *Rome, H. P., and Braceland, F. J.* 184
The Mathematics of the Unconscious. *Baker, S. J.* 192
A Study of the Personality Structure of the Prisoner in Hawaii. *Halperin, S. L.* 213
Creativity in a Middle-aged Psychotic. *Robertson, J. P. S.* 222
*The Schizophrenias of Childhood. *Sackler, A. M., et al.* 224
Some Recent Advances in Cellular Chemistry and Physiology. *Letré, H.* 241
A Program for the Treatment of Psychosis with Cerebral Arteriosclerosis, etc. *Moore, D. F., et al.* 249
A Method for the Evaluation of Hormone Therapy in Schizophrenia. *Hope, J. M., et al.* 267
Quantitated Identification of Psychoses by Blood Sample: I, II and III. *Sackler, R. R., et al.* 283

Significance of the Thalamus in Psychoses.

The thalamic nuclei in twelve cases of dementia praecox, paranoid type, were examined histologically by special methods. All showed an old chronic disease of nerve cells filled with large groups of inclusion bodies sequestered in the cytoplasm. Usually there was a single group in each cell, and the individual inclusions, though closely crowded together, were very large in some cases. Actual loss of cells or breaking of their surfaces was moderate. In fact, most of the cells were intact, and it seemed evident that the cells had tolerated the inclusions for a long time. Honeycombed cytoplasm and slightly vesicular nuclei in old cases with brush-work within the nuclear membrane were usually present. In the cortex changes were more severe, resulting in cell destruction, voiding of inclusions and loss of dendrites and axons. These changes affected the small cells of layers 4 and 3. It seemed reasonable to infer that the hallucinations, delusions and paranoid symptoms were the result of abnormal discharges of thalamic and cortical cells.

In fifteen cases of psychoses with mental deterioration there was always a great loss of nerve cells, as high as 90 per cent. of the cell population, in the association nuclei of the thalamus. The pulvinar and medial dorsal nuclei were often severely destroyed. The cell destruction was probably a slow process with minimal irritation in the thalamus. Damage of all layers of cells in the cortex was a contributing factor. In a number of the cases, necrosis of cells independent of the inclusion bodies, oligogliosis and senile plaques were associated with necrosis, but they were not the usual causes of cell disease and disruption. The latter was a somewhat specific antecedent process related to the inclusion bodies and some hyperergic substance causing the formation of abnormal protein. Distorted growth of honeycombed cytoplasm, brush-work in nuclei, growth of glia fibers, amyloid changes in nuclei of oligoglia cells and proliferation of perivascular and microglia cells indicated abnormal growths of protein.

In cases with sensory disturbances, especially hallucinations and related delusions, there was an acute disruption of nerve-cells in the sensory nuclei of the thalamus. This breaking down of nerve-cells was seen in the lateral geniculate body (visual relay to cortex), in the medial geniculate body (auditory relay to cortex) and in the ventral posterior nucleus (relay for bodily sensibilities to the cortex). The ventral lateral nucleus (relay of cerebellar impulses to cortex) was usually affected.

In senile psychoses of relatively late and sudden onset, with confusion, irritability, disorientation, delusions, loss of memory and symbolic functions, there was an acute breakdown and shattering of nerve cells in the association nuclei of the thalamus. Usually this wholesale disruption of nerve cells filled with large inclusion bodies was most prominent in the pulvinar, lateral posterior and medial dorsal nuclei of the thalamus. Violent behavior seemed to be associated with an acute shattering of cells. Mental deterioration was related to the more complete loss of cells.

Four cases of manic-depressive psychosis showed disease of thalamic cells similar to those of other clinical types. Pycnotic changes were more common. The nerve cells had small, hyalinized nuclei with dwarfed rims of cytoplasm around them. The cells of the cortex were particularly small with the pycnotic nuclei.

Five cases of psychosis with syphilitic meningo-encephalitis differed from the other psychoses chiefly in the thickened meninges and blood-vessels and fenestration of the outer layers 1 and 2 of the cortex.

Axons were studied by the silver technique in the thalamic region in five cases. This included the thalamic radiations, internal capsule, basis pedunculi and adjacent structures. Axonal damage was not a conspicuous feature, but where it occurred it was unmistakable. Dropping out of axons from the bundles of radiations and deformity of axons with enlargements and twistings were abnormal features. Damage to axons occurred in the neighborhood of the diseased nerve-cells. The number of axons in the thalamus was much in excess of nerve-fibers, due to presence of fibers coming from the cortex. Terminal neuropil among the thalamic cells was severely affected.

Disruption of cortical cells and changes in radial bundles were contributing factors in most of the cases. From a limited number of sample sections it was not possible to gain a reliable idea of the distribution of cortical disease. The authors' samples usually included the occipital, temporal, parietal, frontal and hippocampal cortices, but not all parts in all cases. However, it was clear that the cortex was severely involved in cases with simple mental deterioration and in Alzheimer's disease. Gliosis, amyloid bodies, necroses and senile plaques were occasionally seen in these cases. In some instances it seemed that the onset of cortical destruction with small inclusion bodies was a new episode with exacerbation of an old brain disease.

The 36 cases examined histologically showed that disease of thalamic nerve-cells was a constant feature of various clinical types of psychoses. In all cases cortical cells were also involved. Correlation of clinical symptoms with disease of the sensory and association nuclei was strongly suggested by this study. However, it must be stated that the disease was generalized, affecting both thalamus and cortex in various degrees. There was no specific pattern for any type, but only a predominance of cell affection in different areas of the thalamus and cortex, and difference in degree of cell destruction. It seemed that nerve-cells were more involved than axons, and that the active symptoms exhibited by the patients were an expression of altered nerve-cell function. This would favor the current views, which hold that the functional manifestations of the psychoses are basically disorders reflecting fundamentally abnormal physiology and morphologic changes in the thalamo-cerebral level of the central nervous system. The chemical disorder and its hyperergic effects on nuclear (cell) metabolism, glia proliferation, changes in axons and walls of the blood-vessels must be taken into consideration. The moderate changes in the fiber tracts, changes such as demyelination, nests of oligoglia nuclei and amyloid bodies appeared to result from some abnormal protein donated by the nerve-cell disease.

(Authors' abstr.)

Some Biochemical Considerations of Psychotic Behavior.

This paper discusses experiments indicating that disturbances in the balance of enzyme kinetics may be associated with psychotic behavior.

Aberrations of adrenal steroid metabolism in schizophrenic patients are reviewed and considered in relation to possible etiological factors. (Author's abstr.)

Effects of Factors that Modify Cerebral Blood-flow on Hallucinations in Schizophrenia.

Inhalation of carbon dioxide may result in temporary disappearance of hallucinations in some patients with schizophrenia. Marked diminution in cerebral blood-flow may result in reappearance of hallucinations in some schizophrenic patients in whom hallucinations were present in the past ; when cerebral blood-flow is decreased in subjects who never had hallucinations the subjects may experience brief, vivid visual images of events that happened in the distant past. The possible significance of changes in cerebral blood-flow in regard to the appearance or disappearance of hallucinations in various conditions is indicated. (Author's abstr.)

Comparison of Decamethonium Bromide (C10) *and D-Tubocurarine as Preventives of Traumatic Complications in Electroshock Therapy.*

The value of any new relaxant for prevention of traumatic complications in electroshock can be adequately assessed only by carefully controlled comparison with *d*-tubocurarine in a sufficiently large series. The method must take into account differences in pharmacologic action. Such comparisons of the new drug C10 with *d*-tubocurarine in 680 treatments show the following :

1. Paresis was as adequate with C10 as with *d*-tubocurarine.
2. No simple method of determining optimum dosage was found for C10. It is established for *d*-tubocurarine.
3. C10 has an unpredictably variable effect in some patients with repeated dosage.
4. At optimum dosage the effects on circulation and respiration are similar, and neither drug increases the convulsive threshold.
5. Differences in side effects of pre-treatment anxiety and excessive salivation were so slight as to be unimportant. Histamine-like reactions were not seen with either drug.
6. The shorter action of C10 was no advantage in the authors' use of conventional electric shock therapy.
7. C10 has at present no adequate pharmacologic antagonist.
8. Fatigue does not change the action of C10, while it increases the effect of *d*-tubocurarine.
9. Both drugs are relatively safe if competently used. Safeguards are well established with *d*-tubocurarine, but are less so with C10.

D-tubocurarine therefore still remains the drug of choice, compared with C10, for the prevention of traumatic complications in electric shock therapy. (Authors' abstr.)

The Schizophrenias of Childhood.

Investigation of the schizophrenias of childhood is valuable because hereditary influences are more accessible to examination and evaluation, and because maternal contributions *in utero* are temporally less remote and both are less complicated by environmental and somatic factors.

The present report has reviewed the following :

1. Observations on eight childhood schizophrenics treated with histamine over a three-month period. Five were male, three female. Five of the patients had previously been treated elsewhere with E.C.T., with temporary improvement reported in four and no change in one.
2. In this histamine-treated series clinical improvement was recorded as an average of ratings by the psychiatrist, the nurse, the psychologist, and the parent. The results revealed :

Grade	Number of patients.
4+	1
3+	2
2+	3
1+	1
0	1

3. Three patients, in the 9-year age-group, scored 3+ and 4+ improvements. The importance of approaching puberty in those patients who responded best to therapy was taken into account and discussed neuroendocrinologically.
4. Significantly, the patients evidencing best response "tolerated" the least amount of histamine as indicated by blood-pressure.
5. A high tolerance to thyroid hormone was exhibited by all children.
6. A high incidence of thyroid pathology was found in the mothers of the children.
7. A high incidence of compensated schizophrenia was observed in the mothers.
8. The possibility of an *in utero* neuroendocrinologic contribution to the etiology and pathogenesis of schizophrenia is posed.
9. The significance of the age of onset and the changing sex ratio of male to female schizophrenics is raised and discussed.
10. The findings are interpreted in the light of a physiodynamic neuroendocrinologic formulation, suggesting that operative adrenocortical excess is related to the etiology and pathogenesis of schizophrenia. In this light alterations in thyroid physiology and thyroid pathology may reflect the results of compensatory attempts to counter the operative adrenocortical excess.

Histamine biochemotherapy has opened new approaches both to the treatment of the schizophrenias of childhood and to the investigation of the etiology and pathogenesis of this disorder of equilibration. (Authors' abstr.)

J. CLIN. PSYCHOL.

VOL. VIII. JANUARY, 1952.

Symposium on Research Designs in Clinical Psychology. *Cattell, R. B., et al.* . . 5
The Navy—North-Western Matrices Test. *Hunt, W. A., and French, E. G.* . . 65
A Study of Malingering on the C.V.S. Abbreviated Individual Intelligence Scale. *Pollaczek, P. P.* . . . 75
The Relationship between Altitude—I.Q. *Purcell, C. P., et al.* . . . 82
The Relationship between M.M.P.I. Scores and Psychiatric Classification of Army General Prisoners. *Clark, J. H.* . . . 86
Compensation and the Crime of Pidgeon Dropping. *Barbash, J. T.* . . . 92
The Parent as a Rival Sibling. *Berdie, R. F.* . . . 95
The Influence of Color on the Consistency of Responses in the Rorschach Test. *Allen, R. M., et al.* . . . 97
Psychological Tests, Intelligence and Feeblemindedness. *Jastak, J.* . . . 107
A Study of the Validity of Some Hypotheses for the Qualitative Interpretation of the H-T-P for Children of Elementary School Age. *Jolles, I.* . . . 113
The Cornell Medical Index—Health Questionnaire: III. *Brodman, K., et al.* . . 119
Reliability of Graphic Indices in a Projective Test. *Lehner, G. F. J., and Gunderson, E. K.* . . . 125
A Rorschach Test of Sixty-six Adolescents. *Kallstedt, F. E.* . . . 129
Standardization of a Short Form of the Wechsler Vocabulary Subtest. *Finkelstein, M., et al.* . . . 133
The Full-range Picture Vocabulary Test: III. *Coppinger, N. W., and Ammons, R. B.* . . . 136
Common Characteristics Associated with M.M.P.I. Profile Types. *Guthrie, G. M.* . 141
An Investigation of the Relationship between Intelligence and the Statistical Reliability of the M.M.P.I. *Winfield, D. L.* . . . 146
An Indirect Validation of a T.A.T. Scoring Manual. *Goodman, M.* . . . 149
Stimulus Function of the Szondi Cards. *Davis, N. E., and Raimy, V. C.* . . . 155
The Szondi Test as a Forced Choice Technique. *Guertin, W. H., and Rabin, A. I.* . 161
The Influence of Test Instruction on Szondi Results. *Barraclough, P., et al.* . . 165
Anorexia Nervosa. *Palmer, J. O., et al.* . . . 168
A Study of the Psychological Factors in Primary Dysmenorrhoea. *Herzberg, F. I.* 174
A Comparison of the Performance of Stutterers and Non-Stutterers on the Rosenzweig Picture Frustration Test. *Madison, le Roi, and Norman, R. D.* . . . 179
A Comparison of Personality Test Scores and Medical Psychiatric Diagnosis by the Inverted Factor Technique. *Geist, H.* . . . 184
A State Hospital Total Push Program for Regressed Schizophrenics. *Sines, J. O., et al.* . . . 189
The Influence of Body Position on Mental Processes. *Beigel, H. G.* . . . 193
Assessing Psychotherapeutic Protocols with Context Coefficients. *Butler, J. M.* . 199
A Note on the Differentiation of Normal and Neurotic Children by Means of Objective Tests. *Eysenck, J. J., and Prell, D. B.* . . . 202
Post-hypnotic Suggestion in Group Therapy. *Singer, W. B.* . . . 205

J. COMP. NEUR.

VOL. XCVI. FEBRUARY, 1952.

A Study of the Anuran Diencephalon. *Frontera, J. G.* . . . 1
The Tract of Lissauer and its Possible Relation to the Pain Pathway. *Earle, K. M.* 93
Biochemical and Physiological Differentiation during Morphogenesis: XV. *Kavaler, F., and Kimel, V. M.* . . . 113
A Study of the Effect of Complete Frontal Lobe Extirpations on the Fiber Components of the Pyramidal Tract. *Lassek, A. M.* . . . 121
Investigations on the Brain Weight of the Baboon. *Riese, W., and H.* . . . 127
Some Observations on the Fiber Connections of the Di- and Mesencephalon in the Cat: II. *Bucher, V. M., and Bürgi, S. M.* . . . 139

APRIL.

Behavioral Effects of Prefrontal Lobectomy, Lobotomy and Circumsection in the Monkey (*Macaca*). *Wade, M.* . . . 179
Anatomical and Experimental Studies on the Temporal Pole of the Macaque. *Poirier, L. J.* . . . 209
The Lateral Reticular Nucleus of the Medulla Oblongata in Mammals. *Walberg, F.* 283
Inhibition of Formation of a Glial Barrier as a Means of Permitting a Peripheral Nerve to Grow into the Brain. *Windle, W. F., et al.* . . . 359

J. COMP. PHYSIOL. PSYCHOL.

VOL. XLV. APRIL, 1952.

Further Studies on Selective Ablation of Associative Cortex in Relation to Visually Mediated Behavior. *Chow, K. L.* 109
Learned Discrimination Performance by Monkeys after Prolonged Post-operative Recovery from Large Cortical Lesions. *Warren, J. M., and Harlow, H. F.* 119
The Effects of Cochlear Lesions on the Auditory Response of the Guinea-pig. *Gross, N. B.* 127
The Effects of Barbiturates on the Behavior of Rat Offspring as Measured in Learning and Reasoning Situations. *Armitage, S. G.* 146
Learning Behavior in Guinea-pigs subjected to Asphyxia at Birth. *Becker, R. F., and Donnell, W.* 153
Audiogenic Seizures and Streptomycin-induced Vestibular Dysfunction. *Finger, F. W., et al.* 163
Control of the Audiogenic Seizure by the Rat. *Marx, R .H., and Van Spanckeren, W. J.* 170
The Effect of E.C.T. on a Conditioned Emotional Response. *Brady, M. H., and Hunt, H. F.* 180
Stimulational Seizures without Pseudopregnancy in White Rats. *Nolan, C. Y.* 183
Habit Strength as a Function of Motivation during Learning. *Teil, K. S.* 188

J. EX. PSYCHOL.

VOL. XLII. DECEMBER, 1951.

Areal Effects in Foveal Brightness Discrimination. *Ratoosh, P., and Graham, C. H.* 367
The Effect of Alternating Views of the Test Object on Vernier and Stereoscopic Acuities. *Richards, W. J.* 376
Studies on Sensory Conditioning Measured by the Facilitation of Auditory Acuity. *Brogden, W. J., and Gregg, L. W.* 384
A Comparison of Avoidance and Non-avoidance Eyelid Conditioning. *Logan, F. A.* 390
Three Demonstrations Involving the Visual Perception of Movement. *Kilpatrick, F. P., and Ittelson, W. H.* 394
Generalization of a Muscle Action Potential Response to Tonal Duration. *Fink, J. B., and Davis, R. C.* 403
Latent Learning in the Sophisticated Rat. *Fehrer, E.* 409
Dark Adaptation and the Humphreys Random Reinforcement Phenomenon in Human Eyelid Conditioning. *Grant, D. A., and Hake, H. W.* 417
A New Technique for Observing Concept Evocation. *Marks, M. R., and Ramond, C. K.* 424
Studies in Short-duration Auditory Fatigue: I. *Harris, J. D., et al.* 430
Operant Extinction as a Function of the Extinction Schedule. *Bullock, D. H.* 437
The Effect on Extinction Responding of Stimuli Continuously Present during Conditioning. *Firster, C. B.* 443
The Effects of Auditory-vestibular Nerve Pathology on Space Perception. *Mann, C. W.* 450

VOL. XLIII. JANUARY, 1952.

Reaction Time to Kinesthetic Stimulation Resulting from Sudden Arm Displacement. *Chernikoff, R., and Taylor, F. V.* 1
Further Studies of Perception of the Upright when the Direction of the Force Acting on the Body is Changed. *Witkin, H. A.* 9
The Influence of Massed and Distributed Practice on the Development of Mental Set. *Kendler, H. H., et al.* 21
The Accuracy of Prediction Motion. *Gottsdanker, R. M.* 26
The Method of Comparison Applied to the Problem of Memory Change. *Hanawalt, N. G.* 37
Word Recognition as a Function of Retinal Locus. *Mishkin, M., and Forgays, D. G.* 43
Shape Constancy. *Lichte, W. H.* 49
Sound Localization with Conflicting Visual and Auditory Cues. *Wilkin, H. A., et al.* 58
Experiments of Sensory-Tonic Field Theory of Perception: IV. *Werner, H., and Wapner, S.* 68
The Retention of Material Presented during Sleep. *Fox, B. H., and Robbins, J. S.* 75

FEBRUARY.

The Effect of Degree of Shading Contrast in Ink Blots on Verbal Response. *Balloch, J. C.* 120
The Role of Physiological Nystagmus in Monocular Acuity. *Ratliff, F.* 163
The Perception of Obstacles by the Deaf. *Worchel, P., and Berry, J. H* 187

J. GEN. PSYCHOL.

VOL. XLVI. JANUARY, 1952.

The Prediction of Psychological Stability and Anxiety-aggressiveness from a Battery of Tests Administered to a Group of High Grade Male Mental Defectives. *O'Connor, N.* . . . 3
A Laboratory Exercise in Projective Interpretation. *Schofield, W.* . . . 19
Hypnotic Scene Visualization and the Word Association Test. *Schneck, J. M., and Kline, M. V.* . . . 29
The Effect of Nembutal upon Learned Performances of the Rhesus Monkey. *Weiner, R., and Harlow, H. F.* . . . 43
Analytic Evaluation of Psychometric Proficiency. *Du Mas, F. M.* . . . 51
The Mirror Drawing Experiment. *Waters, R. H., and Sheppard, R.* . . . 63
Studies of the Projected After-image: I. *Young, F. A.* . . . 73
Primary Suggestibility and Hypnotic Susceptibility in a Group Situation. *Furneaux, W. D.* . . . 87
A Quantitative Study of Voluntary *versus* Involuntary Movement. *Edwards, A. S.* 93

J. GENET. PSYCHOL.

VOL. LXXX. MARCH, 1952.

Evaluating the Developmental Level of Cerebral Palsy Pre-school Children. *Haeussermann, E.* . . . 3
Identifying the Insecure Child: II. *Mantin, W. E.* . . . 25
Group Therapy with Institutionalized Juvenile Delinquents. *Gersten, C.* . . . 35
Observations on Behavior of Newborn Puppies. *James, W. T.* . . . 65
Some Effects of an Amino-acid Deficiency upon the Performance of Albino Rats in a Simple Maze. *Bevan, W., jun., and Freeman, O. I., jun.* . . . 75
Development in Young Children of an Understanding of Time and the Clock. *Springer, D.* . . . 83
An Investigation of the Vocabulary Performance: I. *Moran, L. J., et al.* . . . 97
Ibid.: II. *Moran, L. J., et al.* . . . 107

J. NERV. MENT. DIS.

VOL. CXV. MARCH, 1952.

*The Effects of Frontal Topectomy on Autonomic Nervous Stability in Schizophrenia. *Glaser, G.-H.* . . . 189
*The Frontal Lobes and Anguish. *Landis, C.* . . . 203
Psychology *vs.* Anatomy in the Treatment of "Arm Neuroses" with Physiotherapy. *Braatoy, T.* . . . 215
Artificial Ecstacy. *Meerloo, J. A. M.* . . . 246

The Effects of Frontal Topectomy on Autonomic Nervous System Stability in Schizophrenia.

(1) The autonomic stability of two groups of chronic schizophrenic patients (paranoid and hebephrenic-catatonic) and a normal control group was tested by means of epinephrine (adrenergic), mecholyl (cholinergic), and cold pressor stimuli. The schizophrenic patients were studied before and after superior and orbital ablations of prefrontal cortex (topectomy). The blood-pressure responses were measured in all instances and the electrical skin resistance was determined with the mecholyl test. Concomitant psychiatric observations were made.

(2) All pre-operative reactions of the paranoid group were within the normal range with all tests. The hebephrenic-catatonic group showed blood-pressure hyporeaction to the mecholyl and cold pressor tests.

(3) After superior and orbital topectomy there was slight, transient hyper-reaction to epinephrine and mecholyl, suggesting a release of cortical inhibition of autonomic functions. The post-operative response to the cold pressor test showed diminished reactivity, in the paranoid group, or the appearance of a normal response where hypo-reactivity existed previously (hebephrenic-catatonic group). Autonomic nervous system stability in schizophrenia is disturbed in only a mild degree after topectomy and rapid compensation seems to occur. No significant differences were observed between the orbital or superior groups.

(4) The relationship between these findings and psychologic factors are discussed and the pertinent literature reviewed. (Author's abstr.)

The Frontal Lobes and Anguish. A New Formulation of an Old Problem.

The advent of psychosurgery has upset the apple-cart of our organized knowledge concerning the functions of the human frontal lobes as well as one large section of the field of psychopathology. The crucial change in those persons who respond to psychosurgery is an affective one, and only to a very minor degree, if at all, an intellectual one. It has been necessary to reconsider not only our older concepts, but also the various reports of changes which are said to follow psychosurgery. The author has tried to show that the significant alteration is to diminution in varying degrees of a specific mental experience which has been given various names by different observers, and which he has termed anguish. He has given evidence indicating that anguish is a specific, delimited, mental phenomenon which occurs in some, but not all, patients suffering from mental illness, and in some, but not all, patients suffering from intractable pain.

He has advanced the hypothesis that this anguish is a specific experience which occurs when some agent carried in the blood-stream sensitizes cortical tissue, usually tissue in the prefrontal areas in persons who are susceptible. This susceptibility is activated largely by the influx of intra-organic sensory impulses probably projected from the thalamic nuclei. This reactivity gives rise to the unique mental experience of anguish.

Finally, he has given some indications of possible procedures which could be applied in a situation where anguish is frequently diminished or abolished, namely, electroconvulsive therapy, which might lead us on to greater objective knowledge both in psychopathology and in neurophysiology than now exists. (Author's abstr.)

APRIL.

Comparative Twin Study on the Genetic Aspects of Male Homosexuality. *Kallmann, K. J.* 283
A Clinico-experimental Investigation into the Psychologic Aspects of Multiple Sclerosis. *Baldwin, M. V.* 299
Effect of Mephenesin on Psychotic Patients. *Holt, W. E.* 343
Toxic Psychosis following Nitrogen Mustard Therapy. *Roswit, B., and Piselsky, J. E.* 356

MAY.

*Organic Sequelae of E.C.T. Including Facial and Body Dysgnosias. *Gallinek, A.* . 377
Psychiatric Aspects of Vagotomy: III. *Szasz, T. S.* 394
*Amphetamine and Addiction. *Knapp, P. H.* 406
Patterns of Sensory Disturbance in the Trunk and Face in Polyneuritis. *Savitsky, N., and E.* 433
*The Effect of Rapid Intravenous Metrazol on the E.E.G. *Smith, J., et al.* . . 443

Organic Sequelae of Electric Convulsive Therapy, including Facial and Body Dysgnosias.

Besides the well-known reactions, electric convulsive therapy may cause manic and paranoid syndromes; also distortions of gnostic function, dysgnosias, involving perception of the patient's own face, fingers and other parts. Faces of strangers may assume a quality of familiarity and grotesqueness, whereas familiar faces may assume a quality of strangeness. (Author's abstr.)

Amphetamine and Addiction.

Amphetamine resembles other sympathomimetic drugs in its mild autonomic nervous effects, but far excels most of them in its central action. It causes wakefulness, anorexia, increased talkativeness and seems to promote an inner feeling of vigorous well-being, favouring constructive activity, but also raising the danger of habit formation.

There are reports of its abuse among alcoholics and institutional inmates. Seven cases of chronic over-usage reported by other authors are analysed, along with 7 additional cases, 4 of which were studied in detail. All used amphetamine, at times dextrarotatory as well as levorotatory, for periods of time up to 15 years. They developed psychic dependence and a compulsion to continue taking the drug. Dosage remained between 20 and 30 mgm. daily in only 3 out of 13 patients; the other 10 increased their consumption to between 100 and 700 mgm. per day. Tolerance develops rapidly to the drug. Though there were periodic autonomic side-effects, no clear-cut hypertension or other physical disability appeared. Except for somnolence, possibly caused by exhaustion, there were no withdrawal phenomena. Transient psychotic reactions, marked by overactivity, delusions and rarely hallucinations, described by others as a complication of amphetamine overdosage, appeared in 4 patients. Three others needed hospitalization at one or another point for psychiatric reasons. Others functioned effectively for a surprising length of time, and sometimes amphetamine seemed to replace more disrupting symptoms, such as alcoholism.

Using a broad, socially oriented definition, addiction to amphetamine does occur, though it is infrequent and often relatively benign.

Detailed study revealed these addicts to be isolated individuals struggling against delinquent tendencies, passive craving, and chronic depression. They were helped by amphetamine, which they had first used at times of particular stress. The drug appears to assist "elated" defensive activity rather than "ecstatic" oblivion. Possibly its peripheral and central effects are part of one process of mobilization for activity. Study of its interaction with chronic character attitudes may be relevant to the investigation of other biologic substances, as well as the biologic side of certain emotional processes.

(Author's abstr.)

The Effect of Rapid Intravenous Metrazol on the Electroencephalogram.

Six cases of polyneuritis, of varied etiology, are reported with specific patterns of sensory disturbance on the trunk and face (diphtheritic, alcoholic, diabetic and Guillain-Barré).

The areas of sensory change correspond to the cutaneous distribution of the distal portions of the nerves involved.

The occurrence of these changes seemed related to severity of involvement rather than to any specific etiologic factor.

It is suggested that these patterns of sensory loss are similar to the characteristic "glove and stocking" loss found in the extremities. (Authors' abstr.)

J. NEUR. NEUROSURG. PSYCHIAT.

VOL. XV. FEBRUARY, 1952.

Cerebral Poliomyelitis in Early Infancy. *Smallpiece, V., and Ounsted, C.* . . . 13
Tridione Compared with Malidone in the Treatment of *Petit mal*. *Butler, A. J. M.* . . 37
*Cognitive Factors in Epilepsy. *Davies-Eysenck, M.* 39
Memory Defects after Head Injury. *Williams, M., and Zangwell, O. L.* . . . 54
Pulse-wave Electrocoma. *Strauss, E. B., et al.* 59
Prolonged Compression of the Brain Resulting from an Extradural Haemorrhage. *Rowbotham, G. F., and Whalley, N.* 64

Cognitive Factors in Epilepsy.

The average intelligence of a group of 161 epileptic patients is only slightly below normal: median I.Q. is 94 on the Progressive Matrices Test and the median V.A.Q. is 96 on the Mill Hill Vocabulary Test.

The distribution of gradings on the Progressive Matrices Test of the epileptic patients differs significantly from that of a normal population.

Over 12 per cent. of the 161 epileptic patients are below the level of mental deficiency on both the verbal and non-verbal tests.

A group of 19 patients whose condition is considered "unchanged" or "worse" show a significant fall in vocabulary quotient on re-testing after an interval of two years: 18 patients whose attacks are decreasing show no significant fall.

Epileptic patients with minor attacks show a larger fall in vocabulary quotient on re-testing than those with major or major and minor attacks, but none of the differences is significant.

Patients whose education has been interrupted due to epilepsy show a significant fall in vocabulary quotient on re-testing.

No group of epileptic patients shows a significant change in progressive matrices quotient on re-testing.

A group of 57 epileptic children, matched for sex, age and score on progressive matrices score with a control group, shows a lower scatter of scores on separate sets of progressive matrices. This difference is suggestive of somewhat greater reliability but is not statistically significant.

The epileptic children took longer to do the Progressive Matrices Test than the control group. This difference is statistically significant, but it is possible that part of the difference is due to the fact that two different testers administered the tests.

The epileptic children's inferiority in immediate memory is not significant, and their inferiority in delayed recall, while somewhat greater, is below the level of statistical significance.

The epileptic children are superior in both fluency scores: in "reproductive fluency" the difference is not significant, but in "imaginative fluency" it is statistically significant.

The epileptic children show no significant difference in vocabulary. (Author's abstr.)

VOL. XV. MAY, 1952.

Ablation of Abnormal Cortex in Cerebral Palsy. *Penfield, W.* 73
The Efferent Fibres of the Hippocampus in the Monkey. *Simpson, D. A.* . . . 79
Studies in Traumatic Epilepsy: I. *Ritchie Russell, W., and Whitty, C. W. M.* . 93
The Action of C10 in Myasthenia Gravis. *Churchill-Davidson, H. C., and Richardson, A. T.* 129

J. NEUROPATH. EX. NEUR.

VOL. XI. APRIL, 1952.

Hemangiomas of the Fourth Ventricle. *Walker, E. A., et al.* 103
Hypothermia Associated with a Mesencephalic Lesion. *Kaplan, H. A., et al.* . . 116
Cerebral Vascular Complications of Metastatic Carcinoma. *Madow, L., and Alpers, B. J.* 137
Intracranial Tumors with Extracranial Metastases. *Winkelman, N. W.* . . . 149

*The Suppression of the Clonic Phase in Electrically Induced Convulsions in Man. *Alexander, L.* 169
Experimental Torticollis of Rhombencephalic Origin. *Kemberling, S. R., et al.* . 182
Cerebral Swelling and Cerebral Edema. *Small, R. G., and Krehl, W. A.* . . 192

The Suppression of the Clonic Phase in Electrically Induced Convulsions in Man.

Electrically induced convulsions in man last an average of 40 seconds—including the latency period of 46–50 seconds—irrespective of the strength and duration of the convulsion inducing stimulus.

Electrically induced convulsions can be made purely tonic instead of tonic-clonic (such as they usually are) by continuing the stimulus which induced the convulsion throughout its entire duration. This observation lends support to Penfield's and Erickson's theory of the cortical origin of the clonic phase, because the clonic phase can be suppressed by a stimulus which must be presumed to have become inhibitory after its original excitatory effect.

Abolition of the clonic phase in no way lessens the depression-relieving effect of electroshock treatment. This clearly indicates that the clonic phase is not necessary for the specific anti-depressant therapeutic effect of electroshock.

As a practical measure the use of this technique of suppressing the clonic phase has proved useful in preventing post-ictal respiratory embarrassment, and has in the author's clinical work almost completely replaced the use of curare in administering electro-shock to individuals with abnormalities of the skeletal system, especially spinal fractures, to pregnant women, and in other conditions in which violent clonic convulsions could be harmful. (Author's abstr.)

J. NEUROPHYSIOL.

VOL. XV. 1952.

*Ipsilateral Facial Representation in Motor Cortex of Macaque. *Lauer, E. W.* . 1
Cortical Response to Stimulation of Lateral Geniculate Body and the Potentiation Thereof by Continuous Illumination of Retina. *Chang, H.-T.* 5
*Cerebro-cerebello Relationships in the Monkey. *Snider, R. S., and Eldred, E.* . 27
Does Injury to an Axon Promptly Induce Altered Excitability in its Cell of Origin? *Renshaw, B., and Rosenbaum, H. E.* 41
Levels of Integration of Respiratory Patterns. *Hoff, H. E., and Breckenridge, C. G.* 47
Influence of Morphine on Respiratory Patterns. *Breckenridge, C. G., and Hoff, H. E.* 57
Studies on Intraretinal Action Potential with Low-resistance Micro-electrode. *Tomita, T., and Funaishi, A.* 75

Ipsilateral Facial Representation in Motor Cortex of Macaque.

1. Under very light ether anesthesia it is possible to elicit ipsilateral facial movements by stimulation of the cerebral cortex of the macaque.
2. Such ipsilateral movements in the macaque are not limited to the upper facial muscles, but include those of the lower part of the face as well.
3. The area for ipsilateral movements is separate and distinct from that for contralateral.
4. Within the primary facial motor area the region for ipsilateral movements lies lateral to that for contralateral but above the subcentral dimple.
5. An area for ipsilateral movement can also be demonstrated in the second motor area on the superior lip of the lateral fissure. This region lies anterior to that from which contralateral facial movements are obtained. (Author's abstr.)

Cerebro-cerebellar Relationships in the Monkey.

Cerebro-cerebellar relationships were studied in the monkey (*Macaca mulatta*) by electrically stimulating various areas on the lateral cerebral surface and recording from the pial surface of the cerebellum (excluding the basal surfaces).

1. Cerebral sensory and motor areas 3, 1, 2 and 4 project to the tactile areas of the cerebellum, i.e., anterior lobe, l. simplex and paramedian lobules and immediately adjacent folia. Cerebral leg regions project to anterior points in the contralateral anterior lobe and to posterior points in both paramedian lobules, whereas cerebral face regions project to posterior points in the anterior lobe and l. simplex and to anterior points in the paramedian lobules. Cerebral arm regions project to intermediate positions in both the anterior cerebellar lobe and paramedian lobule.
2. The cerebral auditory receiving area projects laterally and medially to the lobulus simplex and surrounding folia.
3. The cerebral visual receiving area (area 17) projects to the lobulus simplex and surrounding folia, as do cerebral areas 8 and 9.
4. Areas 6 and 4s of the cerebrum project widely to contralateral crus I and II and lobulus simplex. (Authors' abstr.)

VOL. XV. MARCH, 1952.

*Projection of Cortical Area 6 to Brain Stem in Monkey. *Peterson, E. W., and Bickers, D. S.* 87
Selective Action of Anaesthetics on Synapses and Axons in Mammalian Sympathetic Ganglia. *Larrabee, M. G., and Posternak, J. M.* 91
*Quantitative Distribution of Dipeptidase and Acetylcholine Esterase in Architectonic Layers of Rat Cerebral Cortex. *Pope, A.* 115
Splanchnic Afferent Pathways in the Central Nervous System. *Aidair, O., et al.* . 131
Distribution of Potentials following Stimulation of Olfactory Bulb in Cat. *Berry, C. M., et al.* 139
Effects of Localized Coetical Destruction on Auditory Discriminative Conditioning in Cat. *Meyer, D. R., and Woolsey, C. N.* 149

Projection of Cortical Area 6 to Brain Stem in Monkey.

1. Following strychnine activation, area 6 can be shown to project ipsilaterally to the subthalamic nucleus, the substantia nigra, the tegmentum of the midbrain and pons, the red nucleus and the central grey.
2. The tegmental regions concerned are ventral and dorsolateral portions in the midbrain and pons.
3. These connections must subserve the motor activity, which can be demonstrated on stimulation of area 6 following pyramidal section. (Authors' abstr.)

Quantitative Distribution of Dipeptidase and Acetylcholine Esterase in Architectonic Layers of Rat Cerebral Cortex.

The quantitative distributions of dipeptidase and acetylcholine esterase have been determined in the cytoarchitectonic layers of rat somatosensory isocortex.

Dipeptidase activity is highest in layers II, IV, Vb and VIa. Its architectonic distribution suggests that nerve-cell bodies and perhaps also those of neuroglia are the principal sites of proteolytic activity in the cerebral cortex.

Acetylcholine esterase activity is relatively high in layer I, the junction of layers II and IIIa, and in layers IIIb, Va and Vc. Its intracortical distribution indicates that acetylcholine esterase is primarily associated with the neuropil, and suggests localization of this enzyme at the surfaces of dendrites and axones including synaptic terminals. (Author's abstr.)

J. NEUROPHYSIOL.

VOL. XV. MAY, 1952.

*Effect of Ablation of Prestriate Cortex on Auditory-visual Association in Monkey. *Evarts, E. V.* 191
*Sites of Origin of Electric Potentials in Striate Cortex. *Bishop, G. H., and Clare, M. H.* 201
*Observations on the Mechanism of Experimental Cerebellar Seizures. *Clark, S. L., and Ward, J. W.* 221
Maximum Conduction Velocities of Motor Fibres of Ulnar Nerve in Human Subjects of Various Ages and Sizes. *Wagman, I. H., and Lesse, H.* 235
Cortical Projection Zone of Chorda Tympani Nerve in Cat. *Patton, H. D., and Amassian, V. E.* 245

Effect of Ablation of Prestriate Cortex on Auditory-visual Association in Monkey.

Extensive ablation of the prestriate area (Brodmann's area 18) in the monkey (*Macaca mulatta*) has been found to be without effect on either retention or post-operative learning of a conditional problem requiring the subject to select a red stimulus in the absence of sound and a green stimulus in the presence of the sound of a buzzer. The significance of this finding with regard to the behavioural role of cortico-cortical connections is discussed. (Author's abstr.)

Sites of Origin of Electric Potentials in Striate Cortex.

The location with respect to depth in the optic cortex of the sources of certain components of potential in responses to single optic nerve volleys has been investigated by various techniques in rabbits and cats.

The first spike is assigned to the arrival of impulses over the optic radiation, the second to the first response of cortical cells, probably including Golgi type II cells of layer IV. The following two or three spikes appearing at 1·5 msec. intervals and of 1·5 msec. durations arise from successively higher levels of cortex.

The slow surface-positive wave underlying these spikes appears to be associated with them, the earlier part originating lower in the cortex than the later.

The negative wave immediately following the positive is found in the lower third of the cortex, probably arising from layer VI. Since in an occasional normal record, and uniformly under the influence of strychnine, an earlier and considerably greater negative wave is present, and since this occupies the whole depth of the cortex under strychnine, these two negative waves are inferred to be different in origin.

The late negative wave presumably arises in cells different from those responsible for the positive components. The early negative wave is assigned to conduction from the cell bodies along apical dendrites toward the cortical surface. Its absence in the normal cortical record indicates that such conduction usually does not follow upon afferent stimulation of the cortex. Strychnine, which is too weak to affect the form or intensity of the normal surface-positive components, induces the response represented by this negativity.

With very dilute strychnine, large positive responses of the cortex are followed immediately by the early negativity, but lower responses may show a delay between the positive and early negative waves. In such cases the two negative waves can be distinguished in the same record.

The early positive wave is inferred to represent the activity of basal dendrites of the neurones, of which the spikes represent the activity of the cell bodies. On the basis of the present work and various previous information available as to the character of the activity of other neurones, a tentative description of the course of activation of cortical neurones is proposed. (Authors' abstr.)

Observations on the Mechanism of Experimental Cerebellar Seizures.

1. Cerebellar seizures from cerebellar stimulation occur in the absence of the motor area and most of the cerebral cortex.

2. Although the pathways concerned with the muscular movements involved are not known, the seizures can occur in complete form following section of one basis pedunculi, a pyramid, the dorsal roots to an extremity, the vestibular apparatus, both eighth cranial nerves, or the upper three cervical nerves of both sides.

3. The seizures may occur in complete form after partial splitting of the cerebellum, or in modified form; or may be confined to the homolateral side after complete splitting of the cerebellum.

4. With simultaneous stimulation of the cerebral motor area and the cerebellum no evidence of inhibition of movements induced by the cerebral stimulation was seen, but there was some evidence of facilitation. The cerebral stimuli and associated movement when brief did not stop or obviously change cerebellar effects. Spontaneous movements are commonly superimposed on cerebellar effects. The sequence of movements throughout a seizure being paired and contrasted like the phases of stimulus and rebound, it is suggested that this may represent a basic phenomenon in normal functioning of the cerebellum in its control of muscle synergy. (Authors' abstr.)

J. PERSONAL.

VOL. XX. DECEMBER, 1951.

The Interpersonal Dimension of Personality. *Freedman, M. B., et al.* 143
The Prediction of Social Acceptance by Means of Psychoanalytic Concepts. *Miller, D. R., and Stone, M. E.* 162
Psychological Deficit as a Function of Stress and Constitution. *Pascal, G. R.* . 175
Ego Structure and Mental Deterioration. *Feifel, H.* 188
Identification with the Aggressor. *Sarnoff, I.* 199
A Method for Studying Individual Differences in "Narrow-mindedness." *Rokeach, M.* 219
"Narrow-mindedness" and Personality. *Rokeach, M.* 234

J. PROJ. TECHN.

VOL. XVI. MARCH, 1952.

Rorschach Configurations Associated with Reading Disability. *Vorhaus, P. G.* . 3
Case Study of an Adolescent Boy with Reading Disability. *Vorhaus, P. G.* . . 20
National Differences in "World Test" Projection Patterns. *Buhler, C.* . . 42
A Normative Study of Rorschach Responses of Eight-year-old Children. *Carlson, R.* 56
Childhood Conflict Expressed through Family Drawings. *Hulse, W. C.* . . 66
Rorschach Responses of the Elementary School Child. *Ledwith, N. H.* . . . 80
The Performance of Kindergarten Children on the Rorschach Test. *Meyer, G., and Thompson, J.* 86

J. SOC. PSYCHOL.

VOL. XXXV. FEBRUARY, 1952.

The Relationship between Basal Metabolism and Personality. *Greenberg, P., and Gilliland, A. R.* 3
Sociometric Technique and Experimental Method in Social Psychology. *Gottheil, E.* 9
Representative Studies of Alcoholism and Personality: IV. *Hampton, P. J.* . . 23

The Content of Comic Strips. *Spiegelman, M., et al.* 37
Hypotheses Relating to Worker Frustration. *Eaton, W. H.* 59
The Ethical Discrimination of Various Groups of College Women. *Mull, H. K.* . 60
Social Interaction in Creation and Criticism in the Fine Arts. *Israeli, N.* . . 73
Lifetime Worry Patterns of Three Diverse Adult Cultural Goups. *Dykman, R. A., et al.* 91
A Study of the Components of Adolescent Attitudes Concerning the Role of Women *Walters, J., and Ojemann, R. H.* 101
Untangling the Liberalism-Conservatism Continuum. *Kerr, W. A.* 111

J. SPEECH. HEAR. DIS.

VOL. XVII. MARCH, 1952.

A Ten-year Survey of Speech Disorders among University Students. *Morley, D. E.* 25
Congenital Aphasia. *Gens, G. W., and Bibey, M. L.* 32
Measurement of the Intelligence and Personality of the Deaf. *Berlinsky, S.* . . 39
Speech Disorders among European Military Personnel in World War I. *Bloomer, H., and Shohara, H.* 55

MIND.

VOL. LVI. 1952.

The Identity of Indiscernibles. *Black, M.* 153
Interpretations of Modal Logic. *Von Wright, G. H.* 165
Knowledge and Belief. *Malcolm, N.* 178
Pragmatism, Realism and Positivism in the United States. *Smith, J. W.* . . . 190
Semantic Analysis and Psycho-physical Dualism. *Pap, A.* 200
Counterfactual Conditionals. *Brown, R., and Watling, J.* 222
Free Choice and the Demands of Morals. *Ebersole, F. B.* 234
Some Comments on Mistakes in Statements Concerning Sense-data. *Götlind, E.* . 297
The Distinctive Purpose of Moral Judgments. *Gilman, E.* 307
Could Space be Four Dimensional. *Brotman, H.* 317
Other Minds. *Allen, A. H. B.* 328
Mind as Minding. *Garnett, A. C.* 349
Post-Kantian Idealism and Modern Analysis. *Cleobury, F. H.* 359
Negative Types. *Wang, H.* 366

NEUROPSIQUIAT.

VOL. II. SEPTEMBER, 1951.

The Familial Form of Alzheimer's Disease. *Arndt, M.* 169
A Contribution to the Anatomoclinical Study of the Glio-epitheliomas. *Insausti, T.* 185

PISANI.

VOL. LXV. 1951.

A Contribution to Our Knowledge of the Process of Glial Amoeboidosis. *Biondi, L., and Lauro, S.* 17
Examination under Sodium Amytal in the Prognosis of Prefrontal Leucotomy. *Adragna, S.* 63

PSYCHIAT.

VOL. XV. MAY, 1952.

Notes on Psychoanalytic Group Therapy: I and II. *Sutherland, J. D., and Ezriel, H.* 111 and 119
The Psychiatric Review: II. *Sullivan, H. S.* 127
Further Remarks on the Pathogenesis and Treatment of Schizophrenia. *Szalita-Pernow, A. B.* 143
Personality and Peyotism in Menomini Indian Acculturation. *Spindler, G. D.* . 151
Recovery from a Long Neurosis. *"Mrs. F. H."* 161
Making the Environment Respond to Basic Emotional Needs. *Pratt, D.* . . 179
Practical Problems of Conceptual Psychiatric Research. *Devereux, G.* . . . 189

PSYCHIAT. QUART.

VOL. XXVI. JANUARY, 1952.

The Interaction of Physiological and Psychological Processes in Adaptation. *Cleghorn, R. A.* 1
Free Association, Silence and the Multiple Function of Speech. *Meerloo, J. A. M.* . 21

*Mental Changes Experimentally Produced by L.S.D. *De Shon, H. J., et al.* . . 33
*Prefrontal Leukotomy. *Klotz, M., et al.* 54
Therapeutic Relaxation. *Schmidhofer, E.* 73
Somatic Organization of the Schizophrenic. *Michael, S. T.* 78
Recorded Interviews Demonstrating Organ Choice Mechanisms. *Rogg, S. G.* . . 87
Telepathic Mechanism in Dreams. *Damstra, M. N.* 100

Mental Changes Experimentally Produced by L.S.D.

Observations are reported on the mental changes in normal adults produced by d-lysergic acid diethylamide tartrate (L.S.D.). Seventeen experiments were done on volunteers, 10 men and 5 women, with an age range of 19 to 48 years. Two of the women underwent two experiments each. The drug was given by mouth, usually in dosage of 1 gamma per kilogram of body weight.

Besides subjective symptoms, alterations were observed in the following areas : thinking and speech ; emotion, mood and affect ; sensory and time perception ; behavior ; morbid ideas and sensory experiences ; and neurological signs. The reaction exhibited three phases lasting a total of 12 to 16 hours ; in some subjects a fourth phase, as a post-L.S.D. effect lasting one to several days, was seen.

The L.S.D. reaction showed some aspects of an exogenous toxic picture. Even more impressive, however, was the stimulation of schizophrenic reactions and manifestations. Simple schizophrenic and turmoil states were common. Transient paranoid trends were frequent. Various isolated findings in schizophrenia such as negativism, ambivalence, blocking, and unexplained smiling were witnessed. Schizo-affective and manic-like states were also encountered. Cathartic ventilation was seen in only one subject. The reaction was not specific, and the extent to which it was dependent upon the basic personality of the subject was undetermined.

The clinical effects of L.S.D. imply involvement of the higher or highest centers of the central nervous system, and perhaps of lower levels of the nervous system as well.

Further study of L.S.D. is indicated because of the remarkable simulation of findings seen in schizophrenic and affective psychoses on administration of an amazingly small amount of this substance by mouth. (Authors' abstr.)

Prefrontal Leukotomy : A Clinical Survey of 100 *Cases Given an Active Retraining Program in a Mental Hospital.*

A clinical survey is presented of 100 patients of whom 89 per cent. were classified as schizophrenia, and who were consecutively subjected to bilateral prefrontal leukotomy from March, 1946, to January, 1950.

The post-leukotomy retraining program is described. This appears to be an important adjunct to the rehabilitation of the patient.

Proper orientation of the relatives is an important factor in aiding the patient's extramural adjustment.

The adoption of a uniform and adequate critical breakdown in presenting results leads to a more accurate evaluation.

Though general improvement was obtained in 81 cases, further analysis reveals that only 24 patients were able to leave the hospital, and of these only 7 were regarded as returned to their pre-psychotic status.

In this series there appears to be a relationship between the greater degree of improvement and patients in the younger age-group, those with shorter periods of illness and shorter duration of hospitalization.

Except for the immediate post-operative period, incontinence was relatively improved.

The percentage of abnormal E.E.Gs. increased markedly directly after the procedure ; the patterns gradually improved over a period of more than six months.

Seventeen patients developed *grand mal* seizures up to two years post-operatively ; but of these, only three had persistent attacks. There was no definite relationship between seizure activity in the E.E.Gs. and the incidence of clinical attacks.

Best results were obtained in those patients who had 65 per cent. to 80 per cent. prefrontal leukotomies.

Marked changes in behavior in this series were noted only after severing the fourth (a lower) quadrant. (Authors' abstr.)

APRIL.

A Contribution to the Study of the Phenomenon of Resistance. *Eidelberg, L.* . 177
*A Clinical Evaluation of the Use of C10 in Convulsive Shock Therapy. *Brody, M.* . 205
The Incidence of Mental Diseases as Measured by Census Investigations *versus* Admission Statistics. *Oedegaard, O.* 212
Patient-Therapist Relationship in Multiple Psychotherapy : I. *Dreikurs, R., et al.* 219
Participant Teaching of Psychotherapy by Senior Physicians. *Hill, L. B., and Worden, F. G.* 228
Some Values of the Use of Multiple Therapists in the Treatment of the Psychoses. *Hayward, M. L., et al.* 244

On a Specific Source of Resistance in Psychotherapy Hitherto Underestimated. *Bergler, E.* 250
Some Problems Connected with Fodor's Birth-Trauma Therapy. *Peerbolte, M. L.* . 292
Psychosomatic Implications in a Case of Paget's Disease with Psychosis. *Notkin, J.* 307

A Clinical Evaluation of the Use of Decamethonium Bromide (C_{10}) *in Convulsive Shock Therapy.*

Curare and decamethonium are dissimilar drugs, although both produce muscular relaxation. The weakness produced by curare simulates myasthenia gravis, while the action of decamethonium simulates the paralysis of botulism. Because of their dissimilarity there will be situations where one is to be preferred to the other. In shock therapy, which is a relatively brief procedure, but which has to be repeated on subsequent days (in contradistinction to surgery, where the reverse is true), the advantages of C_{10} would seem to outweigh the disadvantages. The chief advantages are the shorter action of the drug and the relative sparing of the tongue and larynx ; the disadvantages are the lack of antidote and the inability to predict the first dose. These disadvantages can be handled by the method of fractional administration of C_{10}. All drugs mentioned are satisfactory relaxing agents, although the writer prefers decamethonium in shock therapy.

One must close with a warning that curare, syncurine and the barbiturates are extremely valuable, but are potent and dangerous drugs which should not be used unless one is acquainted with their idiosyncrasies and is prepared to handle all emergencies that might arise, including respiratory embarrassment. On the other hand, it has seemed to the writer that administering shock therapy without these modifications is in the same category as operating without an anesthetic. (Author's abstr.)

PSYCHOANAL QUART.

VOL. XXI. APRIL, 1952.

Body Ego during Orgasm. *Keiser, S.* 153
A Waking Screen Analogous to the Dream Screen. *Kepecs, J. G.* 167
The Symbolic Significance of Twins in Dreams. *Brody, M. W.* 172
The Transference Neurosis of the Rat Man. *Kauzer, M.* 181
Three " Extrasensory Perception " Dreams. *Branfman, T. G., and Bunker, H. A.* . 190
Analytic Posturology. *Deutsch, F.* 196
The Return of the Primal Father. *Friedman, J., and Gassel, S.* 215
A Note on Exhibitionism and Scoptophilia. *Saul, L. J.* 224

PSYCHOL. REV.

VOL. LIX. JANUARY, 1952.

Ontogenesis of Emotional Behavior. *Bousfield, W. A., and Orbison, W. D.* . . . 1
Primary Stimulus Generalization. *Wolpe, J.* 8
A Preface to a Psychological Analysis of the Self. *Sarbin, T. R.* 11
Structural Rigidity in Relation to Learning Theory and Clinical Psychology. *Cattell, R. B., and Winder, A. E.* 23
The Process Need. *Maltzman, I.* 40
On the Nature of Inhibition in the Cerebral Cortex. *Hamilton, M.* 49
Responses in Absence of the Acquisition Motive. *Webb, W. B.* 54
Behavior and the Psychophysical Methods. *Graham, C. H.* 62
The Interrupted Task Method in Studies of Selective Recall. *Alper, T. G.* . . . 71
The Nature of the Response in Discrimination Learning. *Spence, K. W.* . . . 89

MARCH.

Prediction in Clinical Psychology and Behavior Theory. *Stone, G. R.* 95
A New Interpretation of Figural After-effects. *Osgood, C. E., and Heyer, A. W.* . 98
Reliability, Ambiguity and Content Analysis. *Schutz, W. C.* 119
Perceptual Organization in the Rat. *Teas, D. C., and Bitterman, M. E.* . . . 130
Visual Perception as Invariance. *Boring, E. G.* 141
The Visual Field and the Visual World. *Gilson, J. J.* 149
Mathematical Formulations of Learning Phenomena. *Spence, K. W.* 152
Further Comment on Approach-Avoidance as Categories of Response. *Nissen, H. W.* 161
Dynamic Hypotheses in Psychology. *Webster, H.* 168
Approach and Avoidance in Discriminative Learning. *Bitterman, M. E.* . . . 172
Innate Constituents of Complex Responses in Primates. *Schiller, P. H.* . . . 177
The Neurophysiology of Learning and Delayed Reward Learning. *Wolpe, J.* . . 192
Delayed Reward Learning. *Seward, J. P.* 200
Maier's Behavior Theory. *Austin, G. A.* 202
An Orientation for Research on Thinking. *Underwood, B. J.* 209
Incidental Memory and Problem-solving. *Sangstow, P.* 221
Effect, Change and Expectation of Reward. *Jones, M. B.* 227

PSYCHOSOM MED.

VOL. XIV. MARCH–APRIL, 1952.

Differential Emphasis in Somatic Response to Stress. *Lacey, J. I., and Van Lehn, R.* 71
Studies of Blood Pressure in Psychiatric Patients under Stress. *Malmo, R. B., and Shagass, C.* 82
*Psychiatric Observations in Patients Treated with Cortisone and ACTH. *Brody, S.* 94
Psychopharmacologic Study of Schizophrenia and Depressions: VI. *Gottlieb, J. S., et al.* 104
Personality in Experimental Semistarvation. *Kjenaas, N. K., and Brožek, J.* 115
Pseudocyesis. *Schopbach, R. R., et al.* 129

Psychiatric Observations in Patients Treated with Cortisone and ACTH.

1. Psychiatric observations of a preliminary series of 8 cases of collagen and allied diseases treated with cortisone and ACTH have been presented.

2. It was found that these hormones induced a variety of emotional responses, as follows:
   - *a.* Initial euphoria in 7 cases.
     Persistent euphoria in 2 cases.
   - *b.* Effects on psychotic reactions in 3 cases.
     - (1) Alleviated.
     - (2) Provoked.
     - (3) Aggravated.
   - *c.* Ambivalance, depression, and other responses in 3 cases.

3. Personality factors always contributed to the emotional reactions to cortisone and ACTH therapy.

4. The direct hormonal, pharmacological and psychological stimulating effect of cortisone and ACTH is responsible for bringing out latent emotional responses of the individual.

5. The emotional factors found in these diseases indicate the presence of a psychosomatic component.

6. The stimulating action of cortisone and ACTH as well as their withdrawal induces an abrupt change of severe physical symptoms deeply embedded in the patient's way of life:
   - *a.* Euphoria was usually evoked initially and psychotic trends were relieved.
   - *b.* This abrupt change in symptoms was experienced as a threat to the psychological and psychosomatic equilibrium, and gave rise to adverse reactions such as delusions, excitement, depressions, hostility and ambivalence.

7. On tracing back the pre-disease personalities it was found that the observed reactions to the hormone treatment coincided with former behavior patterns and appeared to be exacerbated versions of them. (Author's abstr.)

Q. J. EX. PSYCHOL.

VOL. IV. MAY, 1952.

A Test of Sensory Pre-conditioning in Pigeons. *Reid, R. L.* 49
Some Effects of Reward on the Strength of Position Stereotypes in the White Rat. *Knöpfelmacher, F.* 78

Q. J. STUD. ALC.

VOL. XIII. MARCH, 1952.

Evaluation of Antidotes for the Alcohol Reaction Syndrome in Patients Treated with Disulfiram. *Lester, D., et al.* 1
E.E.G. Studies in Alcoholism. *Little, S. C., and McAvoy, M.* 9
Deaths of Alcoholic Patients Treated with Disulfiram in Denmark. *Jacobsen, E.* 16
The Use of Wine and other Alcoholic Beverages by a Group of Italians and Americans of Italian Extraction. *Lolli, G., et al.* 27
Rates of Alcoholism in the U.S.A., 1940–1948. *Jellinek, E. M., and Keller, M.* 49
Use of a Hospital Facility in Conjunction with Outpatient Clinics in the Treatment of Alcoholics. *Walcott, E. P., and Straus, R.* 60
A Study of the Use of Alcoholic Beverages among High-School Students in Utah. *Slater, A. D.* 78
Studies of Drinking in Jewish Culture: III. *Landman, R. H.* 87
Group Therapy in Alcoholism: IX. *McCarthy, R. G.* 95

JUNE.

The Blood Alcohol Curve in Zonal Necrosis, of the Liver. *Sirnes, T. B.* 189
Investigations of an Allergic Factor in Alcohol Addiction. *Robinson, M. W., and Voegtlin, W. L.* 196
Hypoadrenalism and the Alcoholic. *Mann, N. M.* 201

Prevalence of Alcoholism in the Population and among Suicides and Accidents from Poisoning, etc. *Ipsen, J., et al.* . . . 204
The Estimate of the Number of Alcoholics in the U.S.A. for 1949, etc. *Jellinek, E. M.* . . . 215
Drinking Behavior in the State of Washington. *Maxwell, M. A.* . . . 219
A Two-year Survey of Alcoholic Patients in a California State Hospital. *McCullough, W. E.* . . . 240
Community Surveys. *Straus, R.* . . . 254
An Experience of a Non-alcoholic in Alcoholics' Anonymous Leadership. *Thompson, H. S.* . . . 271

RASS. NEUR. VEG.

1951.

A Case of Renal Infantilism. *Matteini, M., and Arcangeli, P.* . . . 5
Modifications of Renal Function Provoked by Histamine Injections in the Lumbar Region. *Ruol, A.* . . . 15

RASS. STUD. PSICHIAT.

VOL. XLI. 1952.

A Complex Case of Hypogenitalism. *Leoni, G., and Coltelli, D.* . . . 1
A Contribution to the Study of Factors Determining the Tendency to Colour and to Form. *Altea, E.* . . . 11
Results and Critical Consideration on the Application of Tsedek's Test in Schizophrenics and in their Parents. *Altea, E.* . . . 22
The Proof of Bilateral Deafness in Mental Illness. *Faleg, G.* . . . 29
Thorn's Test in Shock Therapy. *Rabassini, A.* . . . 33
Tuberculosis and Mental Illness. *Balestrazzi, N.* . . . 44
Prognosis in Cerebro-vascular Lesions. *Lumia, V.* . . . 53
A Case of Dupuytren's Disease Treated with Vitamine E. *Franchini, C.* . . . 59
A Contribution to the Study of Tonicity of the Vegetative Nervous System in Epileptic Syndromes. *Franchini, C.* . . . 67
The Convulsive Threshold in Relation to Multiple Sensory Stimulation of Varying Frequency and Intensity. *Riboli, B.* . . . 137
Clinical Psychoanalysis in Schizophrenia and Prepsychotic Personality. *Rizzo Ercole, M.* . . . 162
The Behaviour of Cholesterol in Electronarcosis. *Dogliano, P.* . . . 186
The Elimination of 17-Ketosteroids in Patients Cured by Convulsive Therapy. *Dogliani, P., and Campi, L.* . . . 193

REV. NEURO.-PSIQUIAT

VOL. XIV. SEPTEMBER, 1951.

Experimental Catatonia. *Gutierrez-Noriega, C.* . . . 339
Electronarcosis. *Vergani, O.* . . . 349
Post-emotional Psychosis. *Rojas, N.* . . . 379
The Fantasies of Delirium Tremens. *Rotondo, H.* . . . 390
Obsessive-compulsive Symptoms and Epilepsy in Childhood. *Majluf, E.* . . . 415
Electrical Stimulation of Sensory Receptors in Psychiatry. *Mendez, M., et al.* . . . 479

REV. NEUROL.

VOL. LXXXV. 1951.

E.E.G. and Clinical Aspects of Subacute Sclerosing Leucoencephalitis. *Radermecker, J., and Macken, J.* . . . 341
The Neuro-surgical Aspects of Sunstroke. *Lazorthes, G., et al.* . . . 413
Medullary Complications of Cervical Disc. *Ricard, A., and Masson, R.* . . . 420

VOL. LXXXVI. 1952.

Cerebral Lesions from Anoxia during Respiratory Paralysis. *Alajouanine, T., et al.* . . . 3
Modifications of the Electrocardiogram of the Rabbit by L.S.D. 25. *Delay, J., et al.* 81

REV. PSIQUIAT. DISCIPL. CON., CHILE.

VOL. XV. 1952.

The Psychopathology of Language. *Roa, A.* . . . 20
Determination of the Somatotype of 150 Students According to Sheldon's Method. *Matte, I., et al.* . . . 52

SCHW. ARCH. NEUR. PSYCHIAT.

VOL. LXIX. 1952.

The Importance of the Conception of Normal and Abnormal in Psychiatry. *Binder, H.* 5
Studies of the Problem of Schizophrenia. *Binswanger, L.* 36
A Contribution to the Study of Carbohydrate Metabolism in Mental Disease, Diabetes and Psychoses. *Duc, L.* 89
The E.E.G. in Character and Behavior Disorders in the Child. *Feldmann, H.* . 170
The Body-Image in Neurology. *Lhermitte, J.* 213
Familial Myoclonic Epilepsy. *Solé-Sagarra, J.* 259
Righthandedness. *Subirana, A.* 321

1. Physiology, Biochemistry, etc.

Biochemical Action of the Nerve. III. Cholinesterase of the Human Serum. Shigeo Okinaka, Osamu Kitamoto, Masami Yoshikawa, Jûya Gotô, Yoshiyata Takahashi and Akira Oyama (Univ. Tokyo). [Igaku to Seibutsugaku (Med. and Biol.), **18**, 114–17 (1951) ; *cf. C. A.*, **45**, 4759*d*.]

Cholinesterase activities (I) of the normal human serum varied among individuals, ranging from 50 to 90 (av. 65·4) (cu.mm. CO_2 evolved/min./c.c. of serum). No effects of sexes, ages, and seasons of the year were observed. Decreases in serum (I) were fairly parallel to the clinical diagnosis and the results of tests for hepatic activities. They were also apparent in neoplastic diseases, especially in cancer of the stomach. Serum (I) in normal humans, in patients with hepatic or neoplastic diseases and in those with tuberculosis was 50–90, 10–60, 20–100 respectively. Characteristic changes in serum (I) were not observed in patients with endocrinological or nervous diseases. Erythrocyte (I) were more active than Plasma (I), the former being parallel to the values of hematocrit and hemoglobin. (I) in the human cerebrospinal fluid is negligibly small. M. N. (Chem. Abstr.).

Significance of Acetylcholine in Development of Central (Nerve) Block. I. N. Volkova (Kazan State Med. Inst.). [Fiziol. Zhur. S.S.S.R., **37**, 422–30 (1951).]

The perfusate taken from the canal of frog spinal cord during a block of its reflex activity loses its blocking ability if treated with cholinesterase. Hence the blocking action of the perfusate depends on the presence of acetylcholine. Disturbance of phospholipide metabolism (removal of pancreas) which disturbs acetylcholine formation also is reflected in the development of block in the spinal cord ; atropine also weakens the development of a block of reflex action. Eserine and acetylcholine added to the perfused solution display a blocking action themselves on the reflex activity of the spinal cord. The reflex action of the spinal cord is not affected *per se* by disturbed production of acetylcholine.
G. M. KOSOLAPOFF (Chem. Abstr.).

Activity of Acetylcholine System in Human Epileptogenic Focus. Donald B. Tower and K. A. C. Elliot (McGill Univ., Montreal, Can.). [J. Applied Physiol., **4**, 669–76 (1952).]

The activities of the components of the acetylcholine (I) system were measured in samples of cerebral cortex from epileptic patients. There was no significant difference between epileptogenic and normal tissue in (I) content or in the rate of synthesis of free (I) by slices incubated in media containing normal and high K concentrations. Epileptogenic tissue showed a tendency to have elevated cholinesterase activity and failed to produce bound (I).
T. McK. (Chem. Abstr.).

Decrease by Narcosis in the Amount of Acetylcholine Extractable from Motor Nerves. Livius Bernardis. [Z. Vitamin-, Hormon- u. Fermentforsch., **4**, 69–82 (1951) (in German).]

Much acetylcholine (I) is lost if tissues are extracted by grinding with sea sand containing carbonates. A synthesis of (I) occurs when ventral roots of the spinal cord are placed in Ringer solution ; the average increase during 2 hours was 33·5 per cent. Eserine has no effect on this synthesis, but narcotics (ether, $CHCl_3$, 10 per cent. EtOH) inhibit this process.
E. HIRSCHBERG (Chem. Abstr.).

Aneurine and Acetylcholine in Nerve Degeneration. Karl Umrath (Univ. Graz, Austria). [Z. Vitamin-, Hormon- u. Fermentforsch., **4**, 19–26 (1951) ; *cf. C. A.*, **44**, 3105*h*.]

The aneurine content of degenerating ischiatic nerves, but not of other nerves, of mammals decreases by 30 per cent. 1-2 days after production of the lesion, but again reaches normal levels on the 4th day. The well-known decrease in acetylcholine content begins only on the 2nd day. ERICH HIRSCHBERG (Chem. Abstr.).

Action of Phenamine (*Benzedrine ?*) *on Content of Acetylcholine and Activity of Cholinesterase in Central Nervous System. E. Kakushkina and L. Petkevich* (*State Biol. Museum, Moscow*). [*Fiziol. Zhur., S.S.S.R.*, **37**, 81–5 (1951).]

Phenamine administered subcutaneously to rats at 10 mgm./kgm. dose does not affect the concentration of acetylcholine in the large hemispheres of the brain, but cholinesterase activity declines over 20–40 minutes, then rises considerably above normal (over 250 per cent.). G. M. Kosolapoff (Chem. Abstr.).

Depolarization of the Motor End-plate by Decamethonium and Acetylcholine. B. D. Burns and W. D. M. Paton (*Natl. Inst. Med. Research, London*). [*J. Physiol.* (*London*), **115**, 41–73 (1951).]

Intravenous and intra-arterial injections of decamethonium (I) caused depolarization of the cat gracilis muscle, as recorded by Ag-AgCl nonpolarizable leads. This effect was localized in the motor-end plate regions of the muscle, and was antagonized by pentamethonium and *d*-tubocurarine chloride. Since a cathode to the end-plate region reproduces the depolarization by (I) and by acetylcholine, and the passage of an anodal current reverses this effect, the end-plate blocking action of these drugs may be the result of a persistent localized cathode. M. Rockstein (Chem. Abstr.).

Effects of Convulsant and Narcotic Drugs on Acetylcholine Synthesis. Hugh McLennan and K. A. C. Elliott (*McGill Univ., Montreal, Can.*). [*J. Pharmacol. Exptl. Therap.*, **103**, 35–43 (1951) ; *cf. C. A.*, **45**, 2565*g*.]

The synthesis of free acetylcholine (I) by brain slices under optimal conditions is accelerated by very low concentrations and inhibited by higher concentrations of a variety of convulsant and narcotic or anticonvulsant drugs (picrotoxin, pentylenetetrazole, thujone, camphor, pentobarbital. phenobarbital, amytal, CBr_3CH_2OH, chloretone, diphenylhydantoin). When two drugs were present together, each in a concentration which alone caused acceleration, inhibition occurred ; this inhibition was greater than was obtained with a considerably higher concentration of either drug alone. The drugs would not replace K as a stimulant of synthesis of (I). No obvious effect on bound (I) was seen. Similar effects of single and paired drugs on (I) synthesis by cell-free brain extracts were obtained, but the inhibitory effects of high concentrations were less marked. The concentrations of narcotics which cause inhibition with slices *in vitro* correspond to the established concentrations *in vivo* during narcosis. The concentrations of water-soluble convulsant drugs which cause acceleration *in vitro* correspond to the established concentrations producing convulsions *in vivo*. Methionine sulfoximine, the toxic factor of NCl_3-treated flour, exerts stimulatory and inhibitory effects on (I) synthesis like the other drugs mentioned. That derived from L-methionine is more active than that from DL-methionine.
L. E. Gilson (Chem. Abstr.).

Action of Narcotics on the Free and Bound Acetylcholine of Rat Brain. Albert Jean Rosenberg and Nicole Etling (*Inst. biol. phys.-chim., Paris*). [*Compt. rend soc. biol.*, **145**, 527–8 (1951).]

Chloral hydrate in the presence of glucose slightly decreased the formation of acetylcholine during the aerobic respiration of rat brain homogenate. Chloretone, gardenal and soneryl had no inhibiting action. L. E. Gilson (Chem. Abstr.).

Lipolytic Activity of Cerebrospinal Fluid in Neurolues. G. G. Giordano (*Univ. Naples*) *and P. Salvi.* [*Acta Neurol.* (*Naples*), **6**, 665–8 (1951).]

The C.S.F. of 46 patients, mostly with progressive paralysis, showed a slightly higher tributyrinolytic activity than normal (1·50 ± 0·82 against 1·40 ± 0·60 c.c. 0·01 N NaOH/100 c.c.). The increase was more evident in C.S.F. of higher protein content. The increased lipolytic activity may be due to activation of the enzyme by albumin, rather than to an increase of the enzyme units. C. Scandura (Chem. Abstr.).

Chromatography of Free Amino-acids in Cerebrospinal Fluid. Dargut Kemali (*Univ. Naples*). [*Acta Neurol.* (*Naples*), **6**, 212–17 (1951).]

By the chromatographic method of Consden *et al.* (*C. A.*, **39**, 537^5) only alanine was found (amounts higher than normal) in the C.S.F. of patients with various nervous diseases, mostly schizophrenia. C. Scandura (Chem. Abstr.).

Citric Acid in the Cerebrospinal Fluid. I. Martensson and T. Thunberg (*Univ. Lund, Sweden*). [*Acta Med. Scand.*, **140**, 454–63 (1951).]

The citric acid content of fluid obtained by lumbar puncture is higher than that of cisternal fluid, which in turn does not materially differ from ventricular fluid (60 p.p.m., 38·8 p.p.m. and 37·2 p.p.m. respectively). There is no sex difference, but the citric acid concentration increases with age. In patients the citric acid concentration is very variable, and is highest in cerebrovascular lesions and lowest in epilepsy and cerebral tumours. In the cerebrospinal fluid the citric acid level is much higher than that in serum, the latter being correlated with that of cisternal fluid. There is close correlation between the citric acid and protein content of the lumbar fluid. S. MORGULIS (Chem. Abstr.).

The Mercuric Iodide Reaction as Applied to the Cerebrospinal Fluid. Masatoshi Yano (Keiô Univ., Tokyo). [Igaku to Seibutsugaku (Med. and Biol.), **19**, 247–9 (1951).]

Serial dilution is made of the cerebrospinal fluid (I) with Ringer solution at pH 7·5 or with 0·066 M phosphate buffer at pH 7·5, and to each 1 c.c. of these solutions are added 1 c.c. of 1 per cent. aqueous Kl solution and 1 c.c. of 1 per cent. aqueous $HgCl_2$ solution in that order. After 24 hours the number of the last test-tube, the content of which remains orange-coloured (*i.e.*, the reaction is negative), is recorded. Negative HgI_2-reactions are given with the 3rd tube, and with (I) from patients with meningitis and with the Froin phenomena until the 6–9th tube and the 9–11th tube, respectively. The increases of lactic acid and of fibrinogen are suggested to play important roles in the HgI_2-reaction with the (I) of patients with meningitis. M. NAKAMURA (Chem. Abstr.).

Atropine and Related Compounds on the Metabolism of Electrically Stimulated Sections of Mammalian Cerebral Cortex. H. McIlwain (Maudsley Hosp., London). [Brit. J. Pharmacol., **6**, 531–9 (1951); *cf. C. A.*, **45**, 3082*f*.]

The increase in respiration and glycolysis of cerebral cortex, brought about *in vitro* by electrical stimulation, was inhibited by atropine, hyoscine, hyoscyamine and cocaine in concentration of 10^{-4} molar. This concentration had little action on normal respiration and glycolysis. Atropine was ineffective in antagonizing increased respiration and glycolysis induced by K or by 2,4-dinitrophenol. Eserine was without effect on normal or stimulated metabolism. RICHARD F. RILEY (Chem. Abstr.).

Actions of Electrical Stimulation and of 2,4-Dinitrophenol on the Phosphates in Sections of Mammalian Brain in vitro. H. McIlwain and Marion B. R. Gore (Maudsley Hosp., Lond). [Biochem. J., **50**, 24–8 (1951).]

The application of potential gradients to sections of cerebral cortex metabolizing *in vitro* caused increased respiration, glycolysis, and inorganic P, and decreased creatine phosphate. About 15 minutes after the stimulation was stopped, metabolic conditions were in part restored to the prestimulation levels. 2,4-Dinitrophenol in 5×10^{-5} M concentration caused maximum increase in respiration, equal to that caused by electrical stimulation. However, the two effects are not additive. The 2,4-dinitrophenol very promptly caused a fall in creatine phosphate and a rise in the inorganic P. S. MORGULIS (Chem. Abstr.).

Prothrombin in Nervous Patients. II. Prothrombin Activity in Vascular Cerebellar Lesions. Mario Ferraris (Univ. Genoa, Italy). [Sistema nervoso, **3**, 343–54 (1951).]

In 45 and 7·5 per cent. respectively of 40 cases prothrombin times were slightly longer (up to 40 seconds) and shorter (14 seconds) than normal. C. SCANDURA (Chem. Abstr.).

Pyruvic Acid in Schizophrenia. L. Dalla Torre (Univ. Rome), V. Boccardelli and G. Bonfiglio. [Lavoro neuro-psichiat., **9**, 420–6 (1951).]

In 26 patients with schizophrenia, without treatment for 2 months, the pyruvic acid content of blood was 1·05–2·50 (average 1·59) mgm. per cent.
C. SCANDURA (Chem. Abstr.).

Carbon Dioxide Accumulation and Oxygen Depletion as Limiting Factors in Convulsive Activity. Gun Belfrage (Pharmacol. Inst., Uppsala, Sweden). [Acta Physiol. Scand., **25**, 15–23 (1952).]

Convulsive seizures were electrically induced in rabbits. The duration of the tonic phase was only slightly affected by inhaling CO_2 in animals which had little or no clonic phase while breathing air. In such animals the duration of the tonic phase was sensitive to O_2 deficit. Other animals, breathing air, showed a pronounced clonic phase, and their tonic phase was much more sensitive to excess CO_2 while relatively less sensitive to O_2 deficit. In different animals the tonic part of the convulsion was limited either by excess CO_2 or by depletion of O_2. The operation of the limiting factor depends on the sensitivity of the central nervous system to CO_2. S. MORGULIS (Chem. Abstr.).

Morphology of Phosphatase Reactions in Nerve Tissues. Salvatore Tolone (Univ. Naples) and Domenico Ventra. [Acta Neurol. (Naples), **6**, 529–617 (1951).]

The topographical and structural distribution (46 photomicrographs) of alkaline and acid phosphatases (respectively by the method of Gomori modified by Danielli (*C. A.*, **44**, 8405*b*) and modified by Moog in the parenchymal and nonparenchymal parts of normal nerve tissues of rabbits, dogs and cats was investigated.
C. SCANDURA (Chem. Abstr.).

Action of Malononitrile in Rabbit Brain. Guido Reale and Lydia D'Argenio (Univ. Siena, Italy). [*Riv. patol. nervosa e mentale*, **72**, 331–41 (1951); *cf. C. A.*, **45**, 3947*b*.]

A histopathological study of rabbits treated with malononitrile or malononitrile + $Na_2S_2O_3$ indicated that the former causes nerve cell degeneration rather than stimulation.
Erich Hirschberg (Chem. Abstr.).

Studies in Permeability in Relation to Nerve Function. III. Permeability of Brain Cortex Slices to Glycine and Aspartic Acid. Saul R. Korey and R. Mitchell (Columbia Univ.). [*Biochem. et Biophys. Acta*, **7**, 507–19 (1951) (*in English*); *cf. C. A.*, **44**, 3592*f*.]

The rates of penetration of N^{15}-labelled glycine, aspartic acid and urea into the interstitial compartment and neuronal cells of rabbit cortical tissue slices were determined. The volume of the interstitial compartment lies between 19 and 34 per cent. of the total, and equilibrium between it and the surrounding medium occurred rapidly (7 to 11 minutes with inulin, 2½ to 5 minutes with the amino-acids). Penetration of amino-acids into the tissue cells did not begin until after interstitial equilibrium was complete, and total equilibrium occurred after 1 hour (glycine) or longer. In contrast to the amino-acids, urea penetrates the tissues as rapidly as the interstitial compartment. The rates of penetration of the two amino-acids are about the same, but that of aspartic acid is very temperate-dependent ($Q_{10} = 1{\cdot}0$). Respiratory inhibition by HCN decreases the rate for aspartic acid, but not for glycine. These differences suggest that the penetration of aspartic acid is associated with an active cell process, while that of glycine is not. Inhibitors of acetylcholinesterase (eserine and DFP) have no effect. Diffusion coefficients calculated from the data are from one-eighth to one-fourth of those determined by standard methods in aqueous solutions.
C. Tanford (Chem. Abstr.).

Effect of Vitamin B_1 on Conditioned Reflex Activity of Dogs. L. O. Zeval'd. [*Zhur. Vysshei̮ Nervoi̮ Deyatel. im. I.P. Pavlova*, **1**, 160–4 (1951).]

While low level injections of vitamin B_1 have no effect on the magnitude of conditioned reflexes, a high dosage (10 mgm. daily or more) leads to decreased magnitude of the reflexes, loss of stability of the reflex activities, and apparently changes in functional state of the cerebral cortex. Stimulants used were light and noise. The threshold level varies with the individual dogs.
G. M. Kosolapoff (Chem. Abstr.).

The Uptake of Radioactive Phosphorus in Normal Brain and Brain Tumours. J. E. Stapleton, Wylie McKissock and H. E. A. Farran. [*Brit. J. Radiol.*, **25**, 69–75 (1952).]

Radioactive P was administered to 34 patients with intracranial space-occupying lesions. The relative concentrations in 13 histologically proved tumours ranged from 0·9:1 to 34·1. The specific activity of normal brain tissue appeared to be not more than half the average specific activity of the body as a whole and was usually less. The specific activity of cellular tumour tissue varied widely, but was considerably above the upper limit of the specific activity of normal brain tissue.
G. L. Clark (Chem. Abstr.).

Dependence of Thyroid Functions on Cerebral Centers. A. A. Voi̮tkevich. [*Zhur. Obshchei̮ Biol.*, **12**, 331–45 (1951).]

Thyroid activity in chicks depends on nerve impulses; it is not restored in decerebrated chicks by giving a centrifugate of homogenized pituitary and physiological salt solution (2 daily 0·5 ml. injections for 10 days) or by methylthiouracil (2 daily 5 mgm. doses *per os* for 10 days).
Julian F. Smith (Chem. Abstr.).

Epileptogenic Action of Glutamate Directly Applied into the Brain of Animals and Inhibitory Effect of Proteins and Tissue Emulsions on its Action. Shosuke Okamoto (Keiô-gijuku Univ. School Med. Japan). [*J. Physiol. Soc. Japan*, **13**, 555–62 (1951).]

The solution of Na glutamate (I) which is injected directly into the brain cortex of dog or guinea-pig can cause epileptic convulsions of the animals. Ovoalbumin, emulsion of brain cortex or muscle and several serum proteins inhibit this epileptogenic action of (I). Animal-charcoal, acid kaolin, gum arabic and $Al(OH)_3$ show no inhibitory action. Addition of nicotine, precipitation of the protein, increase of pH and faradization can protect the inhibitory effect of proteins and tissue emulsions.
Itiro Tyuma (Chem. Abstr.).

Enzymes of Grey Matter and White Matter of Dog Brain; Distribution of Certain Non-oxidative Enzymes. A. R. McNabb (Univ. Western Ontario, London). [*Can. J. Med. Sci.*, **29**, 208–15 (1951).]

Cholinesterase (pseudo- and true), common esterase, phosphomonoesterase, amylase and β-glucuronidase were determined in homogenates of white and grey matter of dog brain. Grey matter had more cholinesterase activity than white matter, with the true cholinesterase predominating in both tissues. The common esterase (tributyrin substrate plus eserine), acid and alkaline phosphomonoesterases and amylase all showed greater activity in homogenates of grey matter than those of white matter. β-Glucuronidase activity was greater in the white matter. W. DONALD GRAHAM (Chem. Abstr.).

Hepatolenticular Degeneration; Biochemical Observations in Children with and without Neurological Symptoms; Hyperaminoaciduria. Bertil Hood and Sven Erik Fagerberg (Falu Hosp., Falun, Sweden). [Acta Med. Scand., **140**, 374–80 (1951).]

A family of 11 children was studied. One child died of hepatic cirrhosis at the age of 9, and 3 children developed hepatolenticular degeneration between 10–12 years. Hepatic involvement with no neurological symptoms was present in 3 girls. They showed pronounced hyperaminoaciduria but normal nonprotein blood N. Feeding a high-protein, low-fat diet with intermittent addition of 1 g. choline did not apparently prevent the progress of the degenerative process. S. MORGULIS (Chem. Abstr.).

Pathologic Physiology of Cerebral Metabolic Disease. Joseph F. Fazekas and Ralph W Alman (Gallinger Munic. Hosp., Washington, D.C.). [Med. Clinics N. Am., **34**. 1801–15 (1950).]

Cerebral metabolism is believed to proceed normally at maximum rate. It may be depressed by substrate deprivation, inhibition, or deficiency of intracellular enzymes, or O lack. Change in hormone concentration seems to have no effect. CO_2 is the best stimulant for cerebral vasodilation. Differences between various parts of the central nervous system in sensitivity to impairment of energy supply are based on local differences in metabolic requirements. ERICH HEFTMANN (Chem. Abstr.).

Proteolytic Enzyme Systems in Patients with Emotional Disorders. James S. L. Jacobs, Philip M. West and Clinton E. Tempereau (Univ. of California, Los Angeles). [Proc. Soc. Exptl. Biol. Med., **78**, 410–12, (1951).]

Determinations of the chymotrypsin concentration in the serum were made as a measure of the rate of protein destruction, and the urinary uropepsin excretion was determined as a measure of adrenal activity. The results show that emotional disorders are accompanied by changes in protein metabolism and adrenal activity. The disturbance is generally in the direction of increased protein catabolism, being well correlated with emotional response when the disorder is essentially an anxiety reaction to acute stress, less well correlated in schizophrenic psychosis, and lacking in correlation in conversion hysteria. A comparison of schizophrenic psychotics with normal controls reveals that the former exhibit a generally higher and more variable state of adrenal activity. L. E. GILSON (Chem. Abstr.).

Changes in Brain Water, Brain Chloride and Serum Chloride after Bilateral Nephrectomy in Rats. Robert G. Small and W. A. Krehl (Yale Univ.). [Proc. Soc. Exptl. Biol. Med., **78**, 378–81 (1951).]

An accurate procedure is described in detail for the determination of Cl in small samples of cerebral tissue. Cerebral edema did not occur in rats subjected to bilateral nephrectomy, nor was there any increase in brain Cl. After nephrectomy the serum Cl fell rapidly.
L. E. GILSON (Chem. Abstr.).

Adenosinetriphosphatase (ATPase) Activity of Brain. Marion B. R. Gore (Maudsley Hosp., London). [Biochem. J., **50**, 18–24 (1951).]

It seems very probable that the mammalian brain contains an enzyme which liberates inorganic P from adenosinetriphosphate (ATP) (by splitting 2 phosphate groups), which is activated by Mg++ and inhibited by Ca++, thiol-group reactants, or NaF. Its function in brain tissue is not clearly understood, and it is not understood how the energy released by the breakdown of ATP is utilized in the brain. Myosin, the ATPase of muscle, is activated by Ca++ and inhibited by Mg++; however, the muscle also contains a labile ATPase activated by Mg++ and inhibited by Ca++ with an optimum pH 6·8 (optimum for myosin is pH 9·4). The brain homogenates also contain an enzyme acting on inorganic pyrophosphate, and it is suggested that two separate enzymes are concerned with the splitting of ATP and of pyrophosphate. S. MORGULIS (Chem. Abstr.).

Electrical Stimulation in vitro of the Metabolism of Glucose by Mammalian Cerebral Cortex. H. McIlwain, G. Anguiano and J. D. Cheshire (Maudsley Hosp., London). [Biochem. J., **50**, 12–18 (1951).]

Glucose, the main substrate of the brain *in vivo*, is almost entirely converted to CO_2, H_2O and lactic acid. Changing potential gradients which cause an increase in respiration of slices of cerebral cortex also increase the rate of utilization of added glucose and the rate of glucolysis (from 15–40 μ mol./gm./hr. to about 100 μ mol./gm./hr.) The response certainly occurs within 2 minutes or even quicker. S. MORGULIS (Chem. Abstr.).

Electrical Phenomena in Nerve. III. Frog Sciatic Nerve. Abraham M. Shanes (Georgetown Univ., Washington, D.C.). [*J. Cellular Comp. Physiol.*, **38**, 17–40 (1951); *cf. C. A.*, **44**, 1612*e*.]

Stabilizers (pyribenzamine, cocaine, procaine, yohimbine) increase the resting potential, delay depolarization during anoxia, and decrease the hyperpolarization in 5 per cent. CO_2. Veratrine resembles Ca precipitants in exerting opposite effects; DDT, in concentrations sufficient to cause weak repetitive activity, had no such action. The fact that effective concentrations are those which modify threshold and the action potential suggests that one common labile factor is involved in these phenomena. Metabolic alterations are an unlikely basis for interpretation of these results, since the concentrations involved are far below those known to have a respiratory effect. K shifts are major factors directly responsible for at least the slower bioelectric fluctuations in nerve.

H. L. Mason (Chem. Abstr.).

A Means of Metabolic Investigation of Small Portions of the Central Nervous System in an Active State. H. McIlwain (Maudsley Hosp., London). [*Biochem. J.*, **50**, 132–40 (1951).]

An apparatus is described by which potential gradients can be applied to tissue pieces weighing 0·2 to 150 mgm. in a saline nutritive medium, without direct contact of the tissue with the electrodes. Increase in the respiratory rate of the tissue thus stimulated can be demonstrated. S. Morgulis (Chem. Abstr.).

The Influence of Adrenocorticotropic Hormone (ACTH) on Central Nervous System and Neuromuscular Function. Gilbert H. Glaser, Clark T. Randt, Paul F. A. Hoefer, H. Houston Merritt and Cornelius H. Traeger. [*Trans. Am. Neurol. Assoc.*, **75**, 98–104 (1950).]

In 29 patients with rheumatoid arthritis, dermatomyositis, toxic diffuse goiter, regional ileitis, multiple sclerosis, progressive muscular atrophy, progressive muscular dystrophy and paralysis agitans ACTH was not permanently therapeutically effective, but produced electroencephalographic and mental disturbances. It also caused salt and water retention, K excretion, alkalosis, hyperglycemia, glycosuria, fall in circulating eosinophils, increased excretion of 11-oxysteroids, 17-ketosteroids, and creatine, hypertension, acne, hirsutism and facial edema. Marion Horn Peskin (Chem. Abstr.).

Some Effects of Cortisone Acetate and ACTH in Neuromuscular Disorders. G. M. Shy, W. V. Cone, S. Brendler, R. Rabinovitch and D. McEachern. [*Trans. Am. Neurol. Assoc.*, **75**, 96–8 (1950).]

Cortisone acetate (in 1 case supplemented by adreno-corticotropic hormone (ACTH)) abolished the myotonic state but led to only doubtful improvement in the dystrophic state in 2 patients with dystrophia myotonica, led to marked improvement in the constitutional state in 1 patient with generalized lupus erythematosus and acute dystrophic process in the skeletal muscles, led to marked improvement in 2 cases of menopausal muscular dystrophy, temporarily aggravated 1 case of myasthenia gravis, and did not improve 1 case each of juvenile progressive muscular dystrophy and motor neuron disease. Six of the 9 patients showed excessive creatinuria (15–85 per cent. of the total creatine-creatinine excretion), which remained constant even with marked clinical improvement. Glucose curves of treated patients showed a higher rise and slower fall than normal.

Marion Horn Peskin (Chem. Abstr.).

The External Diagnostic Localization of Brain Lesions Using Radioactive Potassium. Anthony F. Susen, Wilfred T. Small and Francis D. Moore (Harvard Med. School, Boston, Mass.). [*Surg. Forum, Proc. 36th Clin. Congr. Am. Coll. Surgeons*, 1950, 362–8 (pub. 1951).]

Mainly radiological. The radioactive properties of K^{42}, $(I)^{131}$ (in organic combination) and biochemical factors affecting their localization are discussed.

W. C. Tobie (Chem. Abstr.).

The Moore Technique of Localization of Cerebral Tumors with Radioactive Substances. Edward B. Schlesinger (Presbyterian Hosp., New York, N.Y.) [*Ibid.*, 368–70.]

Failures to localize tumours with radioactive diiodofluorescein were due to anatomical factors. W. C. Tobie (Chem. Abstr.).

Radioactive Potassium, a New Isotope for Brain-tumor Localization. Bertram Selverstone, Wm. H. Sweet and Richard J. Ireton. [*Ibid.*, 371–5; *cf. C. A.*, **43**, 9232*e*.]

K^{42} injected intravenously localizes in high concentrations in most cerebral tumors as compared with normal brain, although astrocytoma may be an exception. Its properties as compared with those of P^{32} are discussed. W. C. Tobie (Chem. Abstr.).

Formation, Flow and Absorption of Cerebrospinal Fluid. (II) Studies with Heavy Water in the Normal Man. Wm. H. Sweet, Bertram Selverstone, Sidney Soloway and DeWitt Stetten. [*Ibid.*, 376–81 ; *cf. C. A.*, **43**, 9209*a*.]

The rates of entry of H_2O and Na into several portions of the cerebrospinal fluid of man were determined by simultaneous determinations of D and Na^{24} after giving heavy water and Na^{24} Cl intravenously. D enrichment was much more rapid than Na^{24} enrichment.

W. C. Tobie (Chem. Abstr.).

The Distribution of Radioactive Phosphorus in Normal and Diseased Brain Tissue. W. Eugene Stern and Curtis Marshall (Johns Hopkins Hosp., Baltimore, Md.). [*Surg. Forum, Proc. 36th Clin. Congr. Am. Coll. Surgeons*, 1950, 400–1 (pub. 1951).]

Cats were given small amounts of P^{32} (as phosphate) intravenously. The uptake of P^{32} was greater in experimental brain lesions than in normal brain tissue. The concentration was greatest in the acid-soluble fraction. W. C. Tobie (Chem. Abstr.).

Schizophrenia and Hormones. Wm. Malamud (Boston Univ., Mass.). [*New Engl. J. Med.*, **244**, 908–14 (1951).]

A review of the relation of schizophrenia to endocrine disturbances, and the use of hormones (particularly adreno-corticotropic hormone and cortisone) for therapy of schizophrenia. Marion Horn Peskin (Chem. Abstr.).

The Color of the Filtrate of the Diluted and Boiled Blood in Psychoses : I. Masatoshi Yano (Keiô Univ., Tokyo). [*Igaku to Seibutsugaku* (*Med. and Biol.*), **20**, 15–19 (1951).]

The blood is diluted to make a 10 per cent. solution with distilled water, heated in the water-bath for 30 minutes, filtered, and the color of the filtrate compared in a Duboscq colorimeter. Marked decreases in the color intensities are observed with the bloods of patients with paralysis, pervitin intoxication, and with the bloods taken soon after electric shock. The patients, whose bloods give filtrates remaining at decreased color intensity for a long time, seem to have a poor prognosis. Pretreatment of the patient with an opiate before the shock prevented the decrease in the color intensity of the filtrate.

Michinori Nakamura (Chem. Abstr.).

Metabolic Patterns of Schizophrenic and Control Groups. M. Kendall Young, Jr., Helen Kirby Berry, Ernest Beerstecher, Jr., and Jim S. Berry (Univ. of Austin, Texas). [*Univ. Texas Pub., No.* 5109, 189–97 (1951).]

The urine and saliva metabolic patterns of 18 male schizophrenics (I) and II controls (II), 20–45 years of age, were studied by chemical and paper chromatographic methods. The (I) showed a higher urinary level of Mg and of all amino-acids except histamine. Diazonium-coupling compounds were found in the urines of (I), but not of (II). Salivary glucose was higher in (I). G. W. Newell (Chem. Abstr.).

Exploration of Metabolic Patterns in Mentally Deficient Children. Louise Cain (Univ. of Texas, Austin). [*Univ. Texas Pub. No.* 5109, 198–205 (1951).]

The urinary metabolic patterns of 13 mentally deficient children, ages 7–11, and 10 controls, ages 5–11, were studied by paper chromatography. In general, the greater excretion of metabolites was associated with a higher degree of mental deficiency. The data indicate that moron, imbecile and control groups each exhibit distinctive excretion patterns.

G. W. Newell (Chem, Abstr.).

Cerebral Circulation and Metabolism in Hyperthyroidism. Peritz Scheinberg (Duke Univ., Durham, N.C. [*J. Clin. Invest.*, **29**, 1010–13, (1950).]

None of the cerebral metabolic functions varies from the normal in hyperthyroidism. It is postulated that cerebral metabolism normally functions at nearly its maximum rate, with a large portion of the energy used by the brain going to maintain its structural and biochemical organization. Psychic manifestations which occur in the brain in hyperthryoidism are not related to local increased metabolism. John T. Myers (Chem. Abstr.).

The Metabolism of Tryptophan in Certain Nervous Diseases. Giuseppe Verga (Univ. Milan) [*Acta Vitaminol.*, **5**, 62–6 (1951).]

The urinary elimination of xanthurenic acid was determined following intake of 100 mgm. *l*-tryptophan per kgm. body weight by 7 patients (4 epileptics, 2 with lateral sclerosis, and 1 with progressive muscular atrophy). A positive xanthurenic index (xanthurenic acid eliminated in mgm./*l*-tryptophan intake in mgm. × 100) was found in 6 cases. The relation between altered tryptophan metabolism and vitamin B_6 insufficiency and the use of pyridoxine in treatment of these nervous conditions was discussed.

F. R. Bucci (Chem. Abstr.).

Connection Between the State of the Nervous System and Variations of the Chloride Content in the Blood. K. S. Kosyakov. [*Fiziol. Zhur. S.S.S.R.*, **37**, 93–102 (1951).]

Examination of much clinical material shows that a state of excitement is accompanied by heightened variability of blood composition, while a state of repression of nervous activity leads to lowered variability, as compared with the normal, constantly present variability. G. M. Kosolapoff (Chem. Abstr.).

Sugar and Lactic Acid in Brain Tissue upon Fading and Re-establishment of the Life Functions of an Organism. M. S. Gaevskaya (Ministry Health, Moscow). [*Arkh. Patol.*, **13**, *No.* 3, 34–41 (1951).]

In brain tissue of dogs dying of acute blood-letting there occurs at the onset of terminal pause a preponderance of glycolysis over respiration. At the instant of onset of clinical death, free sugar vanishes and much lactic acid accumulates ; the picture remains constant for the following 9 minutes, showing almost complete fading of glycolysis. Upon revival there is an immediate rise in free sugar and lactic acid, with a rise in glycolysis which assures a restoration of basic life functions. After 1 hour of revival the lactic acid level reaches normal and oxidative processes take over from glycolysis ; the unusually high sugar level also returns to normal after some 4 hours. G. M. Kosolapoff (Chem. Abstr.).

Recent Studies of the Cerebral Circulation. C. F. Schmidt (Univ. of Pennsylvana, Philadelphia). [*Harvey Lectures, ser.* **44**, 124–44 (1948–1949) ; *cf. C. A.*, **42**, 8941*i*.]

A review of attempts to measure the volume of blood flowing through the brain by using various devices, and of the successful application of an indirect method, i.e., that of determining the rate at which N_2O diffuses from the arterial blood into the brain and thence into the cerebral venous blood. This method has been used in studies concerning the behaviour of the human cerebral circulation under various conditions, e.g., hyperventilation in aviation, hypertension, diabetes, schizophrenia.

Julia O. Holmes (Chem. Abstr.).

Proteolipides, A New Type of Tissue Lipoproteins ; Their Isolation from Brain. Jordi Folch-Pi and M. Lees (McLean Hosp., Waverly, Mass.). [*J. Biol. Chem.*, **191**, 807–17 (1951) ; *cf. C. A.*, **43**, 4318*f*.]

Proteolipides differ from lipoproteins in being insoluble in water but soluble in $CHCl_3$-MeOH-H_2O mixtures. They are present in the following tissues listed in order of decreasing content ; brain white matter, brain tumors, brain grey matter, heart, kidney, liver, lung, smooth muscle, and skeletal muscle ; none in blood plasma. White matter yielded 3 fractions : A is a mixture of proteolipide and free lipides ; pure lipide fractions can be isolated without splitting the proteolipide. The isolated protein moiety contains 1·76 per cent. S and is trypsin-resistant. Proteolipide B is a microcrystallized powder. The composition varies with the method of isolation, and is about 50 per cent. protein, 20 per cent. cerebrosides, and 30 per cent. phosphatides. Proteolipide C is a birefringent white powder. It is 70–75 per cent. protein ; the rest is mainly phosphatides. The protein moiety contains 1·76 per cent. S and is trypsin resistant. Felix Saunder (Chem. Abstr.).

Isolation of Brain Strandin, a New Type of Large-molecule Tissue Component. Jordi Folch-Pi, S. Arsove and J. A. Meath (McLean Hosp., Waverly, Mass.). [*J. Biol. Chem.*, **191**, 819–31 (1951) ; *cf. preceding abstract.*]

Strandin, a substance of high molecule weight, was extracted from brain tissue by 2:1 (by volume) $CHCl_3$-MeOH. It is especially abundant in grey matter. It contains 2·6 per cent. N, $<0{\cdot}2$ per cent. P, and $<0{\cdot}2$ per cent. S ; $<1{\cdot}5$ per cent. neuraminic acid, fatty acids, sphingosine, or a sphingosine-like substance, carbohydrate, and a primary amine which is combined through its NH_2 group. The presence of a chromogenic group which is destroyed quantitatively with the production of brown color on heating with 6 N NCl 15 minutes at 100° has been used for the development of a method for estimation of strandin. Strandin prepared by three different methods yielded essentially identical products which were all electrophoretically homogeneous, and in the ultracentrifuge showed a main component (80 per cent.) with a minimum possible molecule weight of 250,000.

Felix Saunders (Chem. Abstr.).

Preparation of Lipide Extracts from Brain Tissue. Jordi Folch-Pi, I. Ascoli, M. Lees, J. A. Meath and F. N. Le-Baron (McLean Hosp., Waverly, Mass.). [*J. Biol. Chem.*, **191**, 833–41 (1951) ; *cf. C. A.*, **33**, 7834¹ ; *preceding abstract.*]

Lipides are extracted from homogenized brain tissue by means of 2:1 $CHCl_3$-MeOH. Insoluble substances are removed by filtration and the filtrate is washed with water to remove nonlipide contaminants. Proteolipides, strandin, and lipides, with the exception of a constant amount of brain diphosphoinositide which is bound to a protein by a solvent-resistant bond, are extracted by this method. The washing removes from the crude extract all nonlipide contaminants, and most of the strandin and diphosphoinositide. More tissue solids are removed than by other methods, most of the excess being strandin and proteolipides. Felix Saunders (Chem. Abstr.).

Radioactive Isotopes in the Localization of Brain Tumours. Bertram Selverstone. [*Presse méd.*, **59**, 1093–4 (1951).]

P^{32} given intravenously as phosphate buffered at pH 7 is accumulated selectively in meningiomas, metastatic cancer, neurinomas, and especially in gliomas.

A. E. Meyer (Chem. Abstr.).

Metabolic Response in vitro to Electrical Stimulation of Sections of Mammalian Brain. H. McIlwain (*Maudsley Hosp., London*). [*Biochem. J.*, **49**, 382–93 (1951).]

The manometric apparatus was modified to enable the operator to apply electric stimuli to thin brain tissue slices under metabolic conditions. The voltage needed for metabolic response *in vitro* does not differ much from that necessary for autonomic responses *in vivo*. The metabolic response is apparently maximum within 1–2 minutes of the commencement of stimulation. Motor responses *in vivo* occur within fractions of a second. Usually the metabolic response ceased promptly on stopping the current, but in some instances an increased rate persisted for a few minutes after stimulation. Both *in vitro* and *in vivo* the tissue is very resistant to fatigue; an appreciable fall in responses occurs only after some hours. If the voltage applied to brain-cortex slices was above a threshold value, the respiration increased with increase in voltage. S. Morgulis (Chem. Abstr.).

A Case of Pellagrous Neuropathy. P. W. Hutton. [*E. African Med. J.*, **27**, 325–7 (1950).]

Discussion of a case of nicotinic acid deficiency apparently not due to dietary or digestive inadequacy. W. C. Tobie (Chem. Abstr.).

Some Effects of Dehydroascorbic Acid on the Central Nervous System. John W. Patters and Donald W. Mastin (*Western Reserve Univ., Cleveland, O.*). [*Am. J. Physiol.*, **167**, 119–26 (1951); *cf. C. A.*, **45**, 6285*a*.]

The intravenous injection of dehydroascorbic acid (DHA) in rats produces salivation and lacrimation. Lacrimation is prevented by atropine. Salivation is prevented by atropine and by the destruction of the chorda tympani nerve. The intravenous injection of DHA produces a rise in blood-pressure similar to that following the injection of adrenaline. The response is prevented by dibenamine, atropine, sympathectomy with right splanchnicotomy, and by low cervical cordotomy. It is not influenced by adrenalectomy. When repeated injections of a given dose of DHA are given to a rat, the blood-pressure response increases progressively to a maximum and then falls off. The toxicity of DHA is markedly decreased by the administration of artificial respiration. Dibenamine and atropine increases the toxicity. The ascorbic acid level of the brain is more than doubled by the intravenous injection of 200 mgm./kgm. of DHA. A similar dose of ascorbic acid has no effect. It is postulated that the central nervous system stimulation which follows the intravenous injection of DHA is the result of the production of acid by the reduction of neutral DHA to ascrobic acid. E. D. Walter (Chem. Abstr.).

Central Nervous Control of Food and Water Intake. H. M. Bruce and G. C. Kennedy (*Natl. Inst. Med. Research, London*). [*Proc. Roy. Soc.* (*London*), *B*, **138**, 528–44 (1951).]

A study of the influence of the rat hypothalamus on food and water consumption. Lesions of the tuberal nuclei caused obesity, and the effect of reduced water intake upon food consumption was increased. Lesions of the supraoptic region produced diabetes insipidus, and the effect of the ration on water exchange was exaggerated. Variations in the chemical composition of the ration showed that the animal could maintain a constant calcium intake while varying its water consumption widely.

Joseph S. Hepburn (Chem. Abstr.).

2. Pharmacology and Treatment.

p-Hydroxypropiophenone in Psychiatry, with Control of its Activity on the Genital Function of Women. P. Haour and J. Miribel (*Faculté méd., Lyon, France*). [*J. Med. Lyon*, **32**, 991–5 (1951).]

Eight women in full genital activity received daily 0·3–1·5 gm. of p-hydroxypropiophenone (I) for manic-depressive psychosis. In 4 menstruation ceased and their vaginal smears showed increase of karyopyknotic and acidophilous cells. Some treated women showed some thyroidal disorder, which suggested a specific effect on the hypophysiothyrotropic function. Menopausal women showed no effect in vaginal cytology.

G. Sag (Chem. Abstr.).

Pharmacologic Dissociation of Behavior and Electroencephalogram " Sleep Patterns " in Dogs. Morphine, N-allyl-morphine, and Atropine. Abraham Wikler (*U.S. Pub. Health Service Hosp., Lexington, Ky.*). [*Proc. Soc. Exptl. Biol. Med.*, **79**, 261–5 (1952).]

In unanesthetized, uncurarized dogs, certain doses of the above drugs produce similar changes in the electroencephalogram, similar to or identical with the " burst-slow wave " patterns obtained during natural sleep or pentobarbital anesthesia. The significance of these findings is discussed. L. E. Gilson (Chem. Abstr.).

Effect of Phenamine (Benzedrine) on the Activity of the Higher Regions of the Central Nervous System of Animals (White Rats). V. K. Faddeeva. [Zhur. Vyssheĭ Nervnoĭ Deyatel. im. I. P. Pavlova (**1**), 165–86 (1951).]

Phenamine at low dosage (0·6 mgm./kgm.) shortens the latent period of motor reflex reactions and slightly increases non-conditioned reflexes (food, orientation, and defense). This may be attributed to relaxed internal hindrance of the reflexes. Higher doses (1·2 mgm./kgm.) usually give 3-phase action : short initial decrease of latent period, followed by its lengthening or even disappearance of reflex, along with general increase of animal mobility, and a final new shortening of the latent period. High doses (2·4 mgm./kgm.) also generally have 3-phase action, but the 1st stage is very short, while the 2nd lasts for several days and may involve a complete loss of conditioned reflex activity. Here the protective hindrance appears to involve not only the cortex, but also the subcortical layers of the brain. At toxic doses all conditioned reactions are hindered catastrophically, and non-conditioned reflexes decline sharply after an initial enhancement. The drug stimulates the various regions of the brain, and at too high a level causes hindrance to develop.
G. M. Kosolapoff (Chem. Abstr.).

The Use of Vitamin B_{12} in the Management of the Neurological Manifestations of Diabetes Mellitus, with Notes on the Administration of Massive Doses. Salvatore M. Sancetta, Perry R. Ayres and Roy W. Scott (Western Reserve Univ., Cleveland, O.). [Ann. Int. Med., **35**, 1028–48 (1951).]

Vitamin B_{12} exerts a specific though unknown effect on the nervous tissue metabolism in diabetes mellitus leading to complete remission. Massive doses do not appear to carry a cumulative effect. John T. Myers (Chem. Abstr.).

Death Following the Ingestion of Alcohol in an Antabuse-treated Patient. Robert O. Jones. [Can. Med. Assoc. J., **60**, 609–12 (1949).]

In an antabuse-treated case, death followed the ingestion of only 1 fluid ounce (30 c.c.) of rum. The blood AcH was high. Physiol. factors are discussed.
W. C. Tobie (Chem. Abstr.).

Phenylacetylurea in the Treatment of Convulsive Seizures. Sidney Carter, Daniel Sciarra and H. Houston Merritt. [Trans. Am. Neurol. Assoc., **75**, 255–8 (1950).]

Phenylacetylurea (phenurone) (I), tried in 63 patients with seizures, reduced frequency of seizures in 32 per cent. and completely controlled seizures in none. Toxic effects appeared in 62 per cent., and included leukopenia, evidences of liver dysfunctions, and gastro-intestinal disturbances. While (I) has some anticonvulsant activity, it is not superior to the established anticonvulsants, and its toxicity limits its usefulness.
Marion Horn Peskin (Chem. Abstr.).

The Effect of Nembutal on the in vivo Rate of Oxygen Consumption of the Cerebral Cortex. R. G. Grenell and P. W. Davies. [Trans. Am. Neurol. Assoc., **75**, 105–8 (1950).]

A concentration of 0·5 mM. nembutal in the perfusate of the suprasylvian gyrus of the cat cortex caused a drop of 20–25 per cent. in rate of O consumption ; respiration was abolished by 10 mM. Marion Horn Peskin (Chem. Abstr.).

Antagonism and Synergism between Narcotics and Sympathomimetic Amines in their Action on the Central Nervous System of Vertebrates : IV. S. Ya. Arbuzov. [Fiziol. Zhur. S.S.S.R., **36**, 704–11 (1950) ; *cf. C. A.*, **43**, 7141*g* ; **45**, 4827*h*.]

The comparative action of adrenaline, sympathol, ephedrine, phenamine (benzedrine) pervitin, chloral hydrate, and medinal on sympathectomized rabbits was studied, with body temperature, reflex time, and length of narcotic states as the index. The sympathectomized animals show enhanced sensitivity to narcotics, more to medinal than to chloral hydrate. If all neck ganglia are removed the narcotic state is lengthened 2–3 times. Phenylalkylamines change the reflex time by the removal of the 2-phase reaction, with predominance of the hindering component. Antagonism between the two sets of drugs is weakly expressed and re-establishment of body temperature lags far behind the waking period, and the amines only partly compensate the disturbance of the nervous system by the operative means. Animals lacking all neck sympathetic ganglia show very weak waking processes and the action of pharmacological stimulants is lowered.
G. M. Kosolapoff (Chem. Abstr.).

The Anticonvulsant Action of Polyhydroxy Alcohols. Gerhard Bornmann (Univ. Münster i. W. Ger.). [*Arch. exptl. Path. Pharmakol.*, **213**, 114–20 (1951).]

Ethylene glycol, 1,2-propanediol, 1,3-butanediol (I), 1,2,3-propanteriol, and 1,2,4-butanetriol injected subcutaneously significantly protected mice against death from metrazole. (I) raised electro-shock threshold in rats from 50 to 130 per cent. while iso-Pr alcohol (II) raised the threshold 90 per cent. The subcutaneous LD_{50} for mice is 8·41 ml./kgm. for (II) and 16·5 ml./kgm. for (I). Karl F. Urbach (Chem. Abstr.).

The Effect of Emotion and of 2-Tetrahydronaphthylamine on the Adrenal Cortex of the Rat. M. Vogt (Univ. Edinburgh, Scot.). [*J. Physiol. (London)*, **114**, 465–70 (1951).]

Normal adult male Wistar rats subjected, for the first time, to rectal temperature measurement, showed after 1 hour a 40 per cent. drop of normal adrenal ascorbic acid (I) content, established by the method of Roe and Kuether (*C. A.*, **37**, 3118^5). Six days of consecutive training eliminated this response to an emotional stimulus. A subcutaneous injection of 60 mgm./kgm. of 2-tetrahydronaphthylamine (II) caused a fall of (I) by 56 per cent. in normal rats and by 37 per cent. in demedullated rats. Untrained previously adrenalectomized rats with the remaining adrenal demedullated showed an 18 per cent. fall in (I) hour after measurement of rectal temperature. Emotion probably does not release adrenocorticotropic hormone exclusively through stimulation of the adrenal medulla.

M. Rockstein (Chem. Abstr.).

Anticonvulsant Activity of 2,2-*Disubstituted* 1,3-*Propanediols in Electroshock Seizures. F. M. Berger (Wallace Labs., New Brunswick, N.J.).* [*Proc. Soc. Exptl. Biol. Med.*, **78**, 277–9 (1951); *cf. C. A.*, **45**, 265*a*.]

Compounds studied were 2,2-dimethyl-, 2,2-diethyl-, 2,2-dipropyl-, 2-butyl-, 2,2-dibutyl-, 2-ethyl-2-methyl-, 2-isopropyl-2-methyl-, 2-propyl-2-methyl-, 2-butyl-2-methyl-, 2-butyl-2-ethyl-, 2-ethoxy-2-ethyl-, 2-ethyl-2-phenyl-, 2-phenyl-, 2,2-diphenyl-, 2-phenoxy-2-phenyl-, and 2,2-dibenzyl-1, 3-propanediol. All compounds in suitable doses protected mice against electroshock convulsion. The molecule configuration favourable for maximum activity is the presence of a quaternary C atom to which 1 or 2 Ph radicals are attached. Several of the compounds were about as potent as mephenesin. The most potent (the diphenyl derivative) was about one-sixth as potent as Na phenobarbital.

L. E. Gilson (Chem. Abstr.).

Central Nervous Depressive Effect of Khellin. Graham Chen, Charles R. Ensor and David Russell (Parke, Davis & Co., Detroit, Mich.). [*Proc. Soc. Exptl. Biol. Med.*, **78**, 305–7 (1951).]

Khellin (from *Ammi visnaga*) given orally was effective in suppressing excitement induced by caffeine in rats. At slightly depressive levels it was more effective against metrazol than against electroshock convulsions. The central nervous depression produced by khellin in mice is mild but of long duration. Khellin is more toxic for cats than for rats and mice. No excitement was shown by cats after ingestion of a lethal dose.

L. E. Gilson (Chem. Abstr.).

The Action of Diisopropyl Fluophosphonate on the Central Nervous System of the Cat. Mary Chennells, W. W. Floyd and S. Wright (Middlesex Hosp. Med. School, London). [*J. Physiol. (London)*, **114**, 107–18 (1951).]

Intrathecal diisopropyl fluophosphonate (DFP) (0·7 mgm./kgm. body-weight in propylene glycol (2 per cent.) injected at the level of the 7th lumbar vertebra in chloralose- or dial-anaesthetized and decerebrated cats facilitated the knee-jerk-flexor and crossed-extensor reflexes, as determined by the method described by Chennells *et al.* (*C.A.*, **43**, 7587*i*), but the nerve-muscle response was unchanged. No greater sensitivity of one reflex over another to DFP was observed. Larger doses of DFP, however, depressed the same reflexes. DFP in mean dosages of 2·5 mgm./kgm. also enhanced the flexor reflex response to a train of afferent stimuli. Intravenous injections produced similar responses for larger and smaller dosages of DFP, except that potentiation of nerve-muscle responses was also observed in the form of increased amplitude and duration of mechanical response to maximum motor nerve volleys, plus repetitive release of the action potential. In some cases mild generalized convulsive responses were observed for intrathecal injections of DFP, but cases of convulsions from intravenous injection of DFP were more readily obtained and more violent. It is suggested that the potentiation action of DFP is on some part of the central nervous system and similar to that of the anticholinesterases, but the potentiation of reflexes must not be dependent on higher centres, as indicated by results from the decerebrated animals and animals with mid-thoracic spinal transections.

Morris Rockstein (Chem. Abstr.).

Action of Calabash Curare and Related Curariform Substances on the Central Nervous System of the Cat. S. Salama and Samson Wright (Middlesex Hosp. Med. School, London). [Brit. J. Pharmacol., **6**, 459–70 (1951) ; *cf. C. A.,* **44**, 6032*c*.]

d-Tubocurarine (I), calabash curare (II), and curarine dimethyl ether dimethiodide (III) had a central excitant and peripheral paralysing action. The central actions of (III) were weaker than those of (I) and (II). The central activity of (II) was approximately equal to that of (I), but had a greater direct stimulating action on the spinal-cord centres. *d*- and *l*-Bebeerine were inactive centrally and had a very feeble peripheral paralyzing action. β-Erythroidine and dihydro-β-erythrodine had considerable peripheral paralysing activity and no central excitant action but rather a weak, possible nonspecific, central depressant action. RICHARD F. RILEY (Chem. Abstr.).

Convulsive Agents and the Phosphates of Brain Examined in vitro. G. Anguiano and H. McIlwain (Maudsley Hospital, London). [Brit. J. Pharmacol., **6**, 448–53 (1951) ; *cf. C. A.,* **45**, 5271*a*.]

Pentamethylene tetrazole and strychnine did not affect inorganic and creatine phosphate in slices of cerebral cortex *in vitro* in concentrations effective in intact animals. Caffeine and picrotoxin caused relatively small changes. Applied potential gradients, simulating those which cause convulsions *in vivo*, increased O uptake and inorganic phosphate, and decreased creatine phosphate. RICHARD F. RILEY (Chem. Abstr.).

Mode of Action of Sodium Diphenylhydantoinate (Dilantin) in Epilepsy. Robert B. Aird and Louis Strait (Univ. of California Med. School, San Francisco). [J. Pharmacol. Exptl. Therap., **103**, 136–46 (1951).]

Na diphenylhydantoinate raises the convulsive threshold of white mice treated with convulsive doses of cocaine. In cats it decreases the amount of cocaine passing from the blood into the brain tissue and cerebrospinal fluid, and thus protects to a certain extent against convulsive doses of cocaine. L. E. GILSON (Chem. Abstr.).

Effects of Narcotics and Convulsants on Tissue Glycolysis and Respiration. L. J. Webb and K. A. C. Elliott (McGill Univ., Montreal, Can.). [J. Pharmacol. Exptl. Therap., **103**, 24–34 (1951).]

Glycolysis by brain tissue in the presence of O is greatly increased by low concentrations of various narcotics (pentobarbital, phenobarbital, amytal, CBr_3-CH_2OH, chloral hydrate). Maximum glycolytic rate, equal to or exceeding the normal rate of anaerobic glycolysis, occurs when the O uptake is about 50 per cent. inhibited by the drug. The rate of glycolysis is lowered again and the O uptake is further depressed by higher concentrations. Anaerobic glycolysis is unaffected or slightly accelerated by low drug concentrations, but is inhibited by concentrations greater than those which cause maximum aerobic glycolysis. The effects on glycolysis and respiration are reversible at low drug concentrations but irreversible at concentrations that inhibit glycolysis. Pentobarbital exerts similar effects on the metabolism of testis and kidney tissue slices. O uptake by brain slices is increased in the presence of succinate, ascorbate, or glutathione in the presence or absence of the above drugs. Succinate does not affect the aerobic glycolysis induced by pentobarbital ; ascorbate and glutathione reduce it. A few convulsant drugs tested did not markedly affect respiration or glycolysis except at relatively high concentrations.

L. E. GILSON (Chem. Abstr.).

Anticonvulsant Activity of α-Phenylsuccinimides. Graham Chen, Ruth Portman, Charles R. Ensor and Andrew C. Bratton, Jr., (Parke, Davis & Co., Detroit, Mich.). [J. Pharmacol. Exptl. Therap., **103**, 54–61 (1951).]

A large number of derivatives of α-phenylsuccinimide with Me, Et, Pr, allyl, iso-Pr, Bu, and iso-Bu substituted in various positions were tested for anticonvulsant activity. The α, β-Me and Et substituted compounds were more effective against metrazole convulsions than against electroshock convulsions. Methylation of the heterocyclic N of most of these compounds increased the anti-metrazole potency. This enhancing effect decreased with increasing length and branching of the alkyl chain. α, α- and α, β-diphenylsuccinimides were more effective in suppressing electroshock convulsions than metrazole-induced convulsions. Methylation of the heterocyclic N of these compounds diminished their anti-electroshock activity. L. E. GILSON (Chem. Abstr.).

Delayed Arrest of Rat Brain Slice Respiration Caused by Pentobarbital During the Metabolism of Glucose. J. L. Karlsson, V. C. Sutherland and H. W. Elliott (Univ. of California Med. School, San Francisco). [J. Pharmacol. Exptl. Therap., **103**, 1–6 (1951).]

Oxidation by rat brain slices of glucose, but not of pyruvate, in the presence of a concentration of pentobarbital capable of producing anesthesia *in vivo* leads to a delayed but sudden interference with further O uptake. The effect is definitely linked to the metabolism of glucose, since if glucose is added while the tissue is oxidizing pyruvate, metabolic

arrest occurs after a certain length of time. Extracellular toxicity or exhaustion of metabolites has been ruled out, so the metabolic arrest must be caused by phenomena inside the tissue.
L. E. Gilson (Chem. Abstr.).

Central Stimulating and Depressing Effects of Certain Pyrimidine Derivatives. J. Jacob. [*Experientia*, **7**, 352–3 (1951) (*in French*).]

In mice and rabbits 2-amino-4-dimethylamino-5-benzyl-pyrimidine and 2,4-bis (dimethylamino)-5-benzylpyrimidine induce restlessness, tremors and convulsions. They antagonize barbiturate narcosis and restore partially the respiratory rhythm previously depressed by morphine. 2,4-Dipyridyl-5-benzylpyrimidine is a potent narcotic in rabbits.
D. S. Farner (Chem. Abstr.).

Treatment of Persons Suffering from Migraine by Histamine and Antihistamine Substances. László Biro (Országos Társadalombiztositó Intézet Koltói Ann Kárhâza, Budapest). [*Orvosok Lapja és Népegészségugy*, **4**, 11–13 (1948).]

Experiments made on 30 persons showed that subcutaneous injection of 0·01 mgm. histamine caused migraine attacks in 25. The attack could be stopped by giving ergotamine tartrate. Sensitivity could be healed by injections of histamine every second day in doses increasing from 0·001 to 0·01 mgm. Further experiments made on 15 people proved that 11 showed lively reactions on giving histamine. These reactions could be stopped either by gynergen or by 200 mgm. intravenous or intramuscular injections of antistine.
István Fináły (Chem. Abstr.).

INDEX TO VOL. XCVIII.

The General Index covers original articles, reviews and the epitome.

The following names are printed in SMALL CAPITALS: Authors of original articles and of books reviewed. Names of authorities referred to in the text are in ordinary type.

(R.) indicates a *Review*; the title of the book reviewed is followed by the author's name, thus: " Psychoanalysis and its Derivatives, by H. Crichton-Miller (R.)."

(E.) indicates the *Epitome* section; the title of the abstract is followed by the author's name, thus: "Age and human ability. Miles, W. R. (E.),"

The names of authors referred to in the Epitome section are listed in Part II.

PART I.—GENERAL INDEX.

Abreaction, a preliminary investigation into, comparing methedrine and sodium amytal with other methods, by F. Houston, 707
,, the response of the neurotic personality to, by A. Hordern, 630
A-B ridge count and intelligence, a note on the, by T. C. Fang, 185
Acetaldehyde, neuromuscular action of. Sánchez, F. S., and Bertrán, E. C. (E.), 368
Acetylcholine, action of phenamine on content of, and activity of cholinesterase in central nervous system. Kakushkina, E., and Pelkevich, L. (E.), 748
,, and aneurine in nerve degeneration. Umrath, K. (E.), 747
,, content of the brain during exposure to cold, changes in. Milch, L. J., *et al.*, (E.), 510
,, and decamethonium, depolarization of the motor end-plate by. Burns, B. D., and Paton, W. D. M. (E.), 748
,, extractable from motor nerves, decrease by narcosis in the amount of. Bernardis, L. (E.), 747
,, found in excised rat brain, factors affecting. Elliott, K. A. C., and Henderson, N. (E.), 219
,, the role of, in the C.N.S. Feldberg, W. (E.), 510
,, relations between vitamin B_1 and, IV. Ito, S., and Iwai, S. (E.), 367
,, of rat brain, action of narcotics on the free and bound. Rosenberg, A. J., and Etling, N. (E.), 748
,, significance of, in development of central nerve block. Volkova, I. N. (E.), 747
,, synthesis, effects of convulsant and narcotic drugs on. McLennan, H., and Elliott, K. A. C. (E.), 748
,, system, action of, in human epileptogenic focus. Tower, D. B., and Elliott, K. A. C. (E.), 747
ACTH, cortisone, etc., the psychological response to. Rome, H. P., and Braceland, F. J. (E.), 721
,, The influence of, on C.N.S. and neuromuscular functions. Glaser, G. H., *et al.* (E.), 752
Adrenal cortical function and response to convulsive therapy in a case of periodic catatonia, by W. Ross Ashby, 81
Adrenocortical response of mental patients to E.C.T. and insulin hypoglycæmia, an investigation of the, by F. M. Shattock and L. P. Micklem, 287
Adrenaline-like substances, the concentration of, in blood during insulin hypoglycemia, by H. Weil-Malherbe and A. D. Bone, 565
Alcohol addicts, on death-rates and causes of death in. Dahlgren, K. G. (E.), 492
Alcoholic men, the occupational performance of thirty. Hochwald, H. L. (E.), 508
Alcoholism, emotions and biochemical findings in. Fleetwood, M. F., and Diethelm, O. (E.), 347
,, a psychometric examination of latent homosexuality in. Betwinick, J., and Machover, S. (E.), 215
Amphetamine and addiction. Knapp, P. H. (E.), 737
,, effect of, on conditioned behaviours. Yoshii, N., *et al.* (E.), 228
Analytical Biology, by G. Sommerhoff (R.), 488
Aneurine, action of, on muscle fatigue. Lissák, K., *et al.* (E.), 511
,, content of the nerves of B_1-avitaminotic and normal rats. Martin, C., and Lissák, K. (E.), 512
,, interaction of, with some drugs on the neurovegetative system. Dessi, P., and Labo, G. (E.), 367
Antabuse, acetaldehyde content of blood from ethyl alcohol administration after treatment with. Zubiani, A., and Papo, I. (E.), 371
,, the metabolism of, in man. Eldjarn, L. (E.), 226

Antabuse, the metabolism of, in the rat. Eldjarn, L. (E.), 226
  ,, psychiatric implications of the treatment of alcoholism with. Gottesfeld, B. H., *et al.* (E.), 215
  ,, psychotic phenomena provoked by. Martensen-Larsen, O. (E.), 215
  ,, the role of the liver in the detoxification of. Boyd, E. M., and Kingswill, C. J. (E.), 371
  ,, toxic reactions, on the labyrinthine reflexes caused by. Brug, J., and Funcke, A. B. H. (E.), 514
  ,, -treated patient, death following the ingestion of alcohol in an. Jones, R. O. (E.), 756
Anticonvulsant action, molecular structure and. Mercier, J. (E.), 371
  ,, ,, of polyhydroxy alcohols, the. Bornmann, G. (E.), 757
  ,, activity of α-phenylsuccinimides. Chen, G., *et al.* (E.), 758
Anticonvulsants and their effect on mouse convulsions. Cheymol, J., and Thullier, J. (E.), 227
Anticonvulsive action and molecular structure of some heterocyclic pentagonal compounds. Hazard, R., *et al.* (E.), 226
Antidepressive action of 5-(1,3,dimethylbutyl)-5-ethylbarbituric acid. Gottlieb, J. S. (E.), 348
Anxiety states, sympathetic blockade in the treatment of, by S. Smith, 161
Ascorbic acid, effect of, on the gaseous metabolism of the animal brain. Uzbekow, G. A. (E.), 224
Ashby, W. Ross, Adrenal cortical function and response to convulsive therapy in a case of periodic catatonia, 81
A.T.P., effect of, in the chronaxy of the motor zone of the cerebral cortex. Babskii, E. B., and Malkiman, J. I. (E.), 224
Autonomous nervous system and lipide metabolism, the relationship between. Ardy, C., and Montini, T. (E.,) 368
Awareness, studies in the physiology of, by J. W. Lovett Doust and R. A. Schneider, 411, 640

Bailey, D. S. G. M., *et al.*, Clinical and E.E.G. aspects of psychiatric disorders associated with tetany, 618
Barbiturates, effect of, on oxidative phosphorylation. Brody, T. M., and Bain, J. A. (E.), 225
Benadryl, selective inhibition of brain respirations by. Carlisle, E. M., and Crescitelli, F. (E.), 227
  ,, the sympatomatic treatment of paralysis agitans with. Owyang, E. (E.), 370
Berry, H., The Law Relating to Mental Treatment and the Health Service (R.), 191
Binger, C., More About Psychiatry (R.), 344
Blair, J. H., *et al.*, the question of histopathological changes in the testes in schizophrenia, 464
Bleuler, E., Dementia Praecox or the Group of the Schizophrenias (R.), 187
  ,, Textbook of Psychiatry (R.), 719
Blood-brain barrier, studies on the, with radioactive phosphorus. Bakay, L. (E.), 350
Bond, E. D., Thomas W. Salmon, Psychiatrist (R.), 192
Bone, A. D., and Weil-Malherbe, H., The concentration of adrenaline-like substances in blood during insulin hypoglycaemia, 565
Bowlby, J., Maternal Care and Mental Health (R.), 491
Brain, adenosinetriphosphatase activity of. Gore, M. B. R. (E.), 751
  ,, the effect of some antihistamines and calcium preparations in disturbances of the vascular permeability of the. Broman, T. (E.), 221
  ,, glycolysis in the. Lenti, C., and Cafiero, M. (E.), 369
  ,, human, blood flow and oxygen consumption of the, in diabetic acidosis and coma. Kety, S. S., *et al.* (E.), 224
  ,, injury, cessation of dreaming after. Humphrey, M. E., and Zangwill, O. L. (E.), 360
  ,, lesions using radioactive potassium, the external diagnostic localisation of. Susen, A. F., *et al.* (E.), 752
  ,, metabolic response *in vitro* to electrical stimulation of sections of. McIlwain, H. (E), 755
  ,, metabolism and activity. McIlwain, H. (E.), 572
  ,, ,, in abnormal conditions, thought processes as related to. Himwich, H. E. (E.), 502
  ,, the oxygen supply of, and the mechanism of deficiency effects. Optiz, E., and Schneider, M. (E.), 369
  ,, phospholipide, effect of hyperinsulinism on. McGhee, E. C., *et al.* (E.), 366
  ,, slices, relationship of calcium and magnesium, to effects of phenobarbital on oxygen consumption of. Westfall, B. A. (E.), 370
  ,, strandin, a new type of large-molecule tissue component, isolation of. Folch-Pi. J., and Meath, J. A. (E.), 754

Brain, and Thought, by J. Lhermitte (R.), 718

,, tissue, distribution of radioactive phosphorus in normal and diseased. Stern, W. E., and Marshall, C. (E.), 512

,, ,, the localization of some acid phosphatases in. Naidoo, D., and Pratt, O. E. (E.), 360

,, ,, preparation of lipide extracts from. Folch-Pi, J., *et al.* (E.), 754

,, ,, sugar and lactic acid in, upon fading and re-establishment of the life functions of an organism. Gaevskaya, M. S. (E.), 754

,, tumors use of positron-emitting radioisotopes for the localization of. Wrenn, F. R., jun., *et al.* (E.), 366

,, ,, radioactive isotopes in the localization of. Sebrerstone, B. (E.), 755

,, water, brain chloride and serum chloride after bilateral nephrectomy in rats, changes in. Small, R. G., and Krehl, W. A. (E.), 751

BRAR, S. R., Marriage and the Jewish Tradition (R.), 489

BRAZIER, M. A. B., The Electrical Activity of the Nervous System (R.), 343

BULLOCK, F. N., and FLEISCHHACKER, H. H., studies in schizophrenia, 466

C 10, a clinical evaluation of the use of, in convulsive shock therapy. Brody, M. (E.), 743

Carbohydrate metabolism in psychiatric patients, the diagnostic significance of certain tests of, and the question of "oneirophrenia," by W. Mayer-Gross, 683

Cardiazole administration, convulsions in adult and young dogs after. van Bork, J. J., *et al.* (E.), 371

CARPENTER, R. K., and MACLEOD, L. D., The effects of ethyl alcohol and acetaldehyde on maze behaviour and motor co-ordination in rats, 167

Catatonic stupor, interventricular medication in. Sherwood, S. L. (E.), 498

Central nervous action of hydantoins, oxazolidinediones and thiazolidones. Chen, G., *et al.* (E.), 348

,, ,, control of food and water intake. Bruce, H. M., and Kennedy, G. C. (E.), 755

C.N.S. in an active state, a means of metabolic investigation of the. McIlwain, H. (E.), 752

,, of the cat, action of calabash curare and related curariform substances on the. Salama, S., and Wright, S. (E.), 758

,, ,, the action of diisopropyl fluophosphonate on the. Chennells, M., *et al.* (E.), 757

,, and changes in brain metabolic concentration. Chance, M. R. A. (E.), 227

,, distribution of thiopental in. Hubbard, T. F., and Goldbaum, L. R. (E.), 372

,, presence of histamine in extracts of. Cicardo, V. H., and Stoppani, A. O. M. (E.), 223

,, some effects of dehydroascorbic acid on the. Patters, J. W., and Mastin, D. W. (E.), 755

,, post-mortem changes in acid-soluble phosphorus fraction of. Maleci, A. (E.), 366

,, the presence of cholinergic and noncholinergic neurones in the. Feldberg, W., *et al.* (E.), 367

,, of vertebrates, antagonism and synergism between narcotics and sympathomimetic amines in their action on the. Arbuzov, S. Y. (E.), 756

Central and peripheral nervous excitability in mammals before and after prostigmine. Cicardo, V. H., and Bremier, R. (E.), 513

Cerebellar seizures, observations on the mechanisms of experimental. Clark, S. L., and Ward, J. W. (E.), 740

Cerebral blood-flow and metabolism in neurosyphilis. Heymann, A., *et al.* (E.), 369

,, centres, dependence of thyroid functions on. Voĭtkevich, A. A. (E.), 750

,, circulation and metabolism in hyperthyroidism. Scheinberg. P. (E.), 753

,, ,, recent studies of. Schmidt, C. F. (E.), 754

,, changes in insulin poisoning, production of. Töbel, F., and Maier, H. (E.), 371

,, chemoreceptor buffers, further studies of the, etc. Taylor, R. D., and Page, I. H. (E.), 370

,, circulation, action of adrenaline and hydergin on. Rothlin, E., and Taeschler, M. (E.), 370

,, cortex, atropine and related compounds on the metabolism of electrically stimulated sections of mammalian. McIlwain, H. (E.), 749

,, ,, electrical stimulation *in vitro* of the metabolism of glucose by mammalian. McIlwain, H., *et al.* (E.), 751

,, ,, isolated nuclei from cells of the. Richter, D., and Hullin, R. P. (E.), 225

,, ,, of man, the, by W. Penfield and T. Rasmussen (R.), 188.

,, ,, in man, suppression-burst activity from isolated. Henry, C. E., and Scoville, W. B. (E.), 728

,, ,, the supplementary motor area of the. Penfield, W., and Welch, K. (E.), 348

Cerebral cortical slices, the effects of increased potassium concentration on the metabolism of rat. Lipsett, M. N., and Crescitelli, F. (E.), 221

,, disease, salt-wasting syndrome associated with. Peters, J. P., *et al.* (E.), 511

,, effects of pentothal sodium in the toxemias of pregnancy. Taylor, H. W., and McCall, M. L. (E.), 512

,, metabolic disease, pathologic physiology of. Fazekas, J. F., and Alman, R. W. (E.), 751

,, Palsied Children, the Educability of, by M. I. Dunsden (R.), 717

,, tumours, the localization of, with radioactive derivatives of fluorescein. Belcher, E. H., and Evans, H. D. (E.), 223

,, ,, the Moore technique of localization of, with radioactive substances. Schlesinger, E. B. (E.), 752

Cerebro-cerebello relationships in the monkey. Snider, R. S., and Eldred, E. (E.), 739

C.S.F., cell content of. Bedford, T. H. B. (E.), 219

,, changes in the, during pneumoencephalography. Bickerstaff, E. R. (E.), 367

,, ,, in toxicosis due to infantile diarrhoea. Choremis, C., *et al.* (E.), 511

,, chemical analysis of spectrophotometric findings in the. Spiegel-Adolf, M., *et al.* (E.), 209

,, chlorides in, in normal and pathological conditions. Trautman, S., and Ambard, L. (E.), 219

,, chromatography of free amino-acids in. Kemali, D. (E.), 748

,, citric acid in the. Martensson, I., and Thunberg, T. (E.), 748

,, colorimetric determination of acetone bodies in the Kodama, T., *et al.* (E.), 511

,, formation, flow and absorption of. Sweet, W. H., *et al.* (E.), 753

,, globulin, the precipitation of, by zinc sulfate. Donovan *et al.* (E.), 219

,, of an infant with toxic gastro-enteritis, the appearance of uric acid in the. Ferenz, P., and Boda, D. (E.), 511

,, lipolytic activity of, in neurolues. Giordano, G. G. (E.), 748

,, the mercuric iodide reaction as applied to the. Yano, M. (E.), 749

,, penicillin in the. Redfern, J. W. T., *et al.* (E.), 366

,, the presence of a reticulocytogenic factor in the. Agostini, L. (E.), 219

,, the residual nitrogen of. Lickint, F. (E.), 510

,, shifting of cations in the, as a cause of pruritus. Koenigstein, H. (E.), 510

,, the urea nitrogen content of. Lickint, F. (E.), 510

Cerebrum, oxygen consumption of the. Covian, F. G. (E.), 222

CHAMBERLAIN, G. H. A., and RUSSELL, J. G., The E.E.Gs. of the relations of schizophrenics, 654

CHAMBERLAIN, H. A., and LYKETSOS, S. G., Relationship between insulin coma threshold of schizophrenic patients and their resting E.E.Gs., 122

Children and radio. Ricciuti, E. A. (E.), 355

Cholesterol content of tabetic spinal cord. Dixon, K. C., and Herbertson, B. M. (E.), 512

Cholinesterase in encephalitic Parkinsonism. Barbato, L. (E.), 218

,, of red cells in mental diseases. Barbato, L., and Terrana, V. (E.), 218

Cholinesterases, preparation of soluble, from mammalian heart and brain. Ord, M. G., and Thompson, R. H. S. (E.), 510

Cingulate-cerebellar mechanisms in the physiological pathogenesis of epilepsy. Lennox, M. A., and Robinson, F. (E.), 204

Cingulate cortex in the rabbit, an experimental study of the hippocampal connexions of the. Adey, W. R. (E.), 201

,, gyrus, anterior and the corpus callosum. Nielsen, J. M. (E.), 203

Clonic phase in electrically induced convulsions in man, the suppression of the. Alexander, L. (E.), 739

COBB, S., Emotions and Clinical Medicine (R.), 189

Conditioned reflex activity in dogs, effect of vitamin B_1 on. Zeval'd, L. O. (E.), 750

Convulsive activity, carbon dioxide accumulation and oxygen depletion as limiting factors in. Belfrage, G. (E.), 749

,, agents and the phosphates of brain examined *in vitro*. Anguiano, G., and McIlwain, H. (E.), 758

,, seizures, phenylacetylurea in the treatment of. Carter, S., *et al.* (E.), 756

Convulsions in the cat, experiments on the prolongation of induced epileptiform, by H. Ruf, 454

,, inhibitory action of CO_2 on experimental. Moussatché, A. (E.), 227

Corpora amylacea of the C.N.S., the histochemistry of the. Bravi, G. (E.), 221

Cortical spreading depression of activity, the slow voltage variations of. Leão, A. A. P. (E.), 353

Cortisone or ACTH, effect of treatment with, on anatomy of the brain. Castor, C. W., *et al.* (E.), 220

,, clinical trial with, in the treatment of chronic schizophrenia. Cohn, J. B., *et al.* (E.), 353

,, in the treatment of schizophrenia, by Linford Rees and G. M. King, 401

Cortisone and ACTH, psychiatric observations in patients treated with. Brody, S. (E.), 745
,, acetate and ACTH, some effects of, in neuromuscular disorders. Shy, G. M., *et al.* (E.), 752
Croft, P. G., the assessment of pain perception, 427
,, the effect of electrical stimulation of the brain on the perception of pain, 421
Crookes, T. G., and Hall, K. R. L., Learning impairment. II. Psychoneurotic patients, 273
Curran, Desmond, " Psychiatry Ltd.," 373
Cushing's syndrome, neuropsychiatric aspects of. Trethowan, W. H., and Cobb, S. (E.), 724
Custance, J., Wisdom, Madness and Folly (R.), 343

Dandy's striatal theory of " the center of consciousness." Meyers, R. (E.), 198
Davies, G., and Paterson, A. S., The use of " Etamon " for high blood-pressure in electro-cerebral treatment, 306
Decerebration rigidity of *Bufo arenarum* as test for curarizing substances. Patetta, M. A. (E.), 223
Dementia Praecox or the Group of the Schizophrenias, by E. Bleuler (R.), 187
Dentistry, Psychosomatics and Suggestion Therapy in, by J. Stolzenberg (R.), 344
Depersonalization, some clinical and aetiological aspects of, etc., by A. A. Robin and E. J. Harrison, 469
DFP, mechanism of seizures induced by. Bouzarth, W. F., and Himwich, H. E. (E.), 722
Disseminated sclerosis, the familial incidence of, and its significance. Pratt, R. T. C., *et al.* (E.), 201
,, ,, an investigation of the psychiatric aspects of. Pratt, R. T. C. (E.), 360
Donovan, J. F., *et al.*, Clinical and E.E.G. aspects of psychiatric disorders associated with tetany, 618
Doust, J. W. Lovett, Spectroscopic and photo-electric oximetry in schizophrenia and other psychiatric states, 143
,, and Schneider, R. A., Studies on the physiology of awareness, 411, 640
Dracoulides, N. N., Psychanalyse de l'Artiste et son Oeuvre (R.), 716
Drawings of depressed patients, the effects of E.C.T. on the, by R. Hetherington, 450
Dreams in sand, by L. F. W. Eickhoff, 235
Drugs, effect of. Hoch, P. H., *et al.* (E.), 494
,, that modify personality functions, mechanisms of action of. Wikler, A. (E.), 494
Dunsdon, M. I., The Educability of Cerebral Palsied Children (R.), 717

E.C.T. action, a theory of, and its bearing on the biological significance of epilepsy, by M. Roth, 44
,, comparison of decamethonium bromide and D. tubocurarine as preventives of traumatic complications of. Bennett, A. E., *et al.* (E.), 731
,, effect of, on the blood-pressure in psychotic patients. Igersheimer, W. W., and Stevenson, J. A. F. (E.), 198
,, the effects of, on mental functions as revealed by psychological tests. Brower, D., and Oppenheim, S. (E.), 359
,, organic sequelae of, including facial and body dysgnosias. Gallinek, A. (E.), 737
,, psychological changes due to, as measured by a battery of tests given repeatedly, by R. Hetherington, 334
,, in schizophrenia. Palmer, D. M., *et al.* (E.), 210
,, see under drawings of depressed patients
E.E.G. in ACTH and cortisone-treated patients. Pine, I., *et al.* (E.), 353
,, the, in aged patients of a mental hospital, by W. McAdam and W. T. McClatchey, 711
,, changes after hyperventilation and psychoton in epileptics. Serel, M., *et al.* (E.), 728
,, ,, associated with experimental temporary focal cerebral anemia. Harvey, J., and Rasmussen, T. (E.), 353
,, the effect of rapid intravenous metrazol on the. Smith, J., *et al.* (E.), 737
,, findings in a certain type of psychosomatic headache. Weil, A. A. (E.), 729
,, reflections on one hundred capital cases submitted to, by D. Hill and D. A. Pond, 23
,, " sleep patterns " in dogs, pharmacologic dissociation of behaviour and. Wikler, A. (E.). 755
,, study of the antagonism between metrazol and sodium amytal. Kirstein, L. (E.), 728
E.E.Gs., anticonvulsant drug therapy of behaviour problem children with abnormal. Pasamanick, B. (E.), 198
,, of normal adults, theta and beta rhythm in the. Mundy-Castle, A. C. (E.), 499

E.E.Gs., relationship between insulin coma threshold of schizophrenic patients and their resting, by G. H. A. Chamberlain and G. Lyketsos, 122
Eickhoff, L. F. W., The aetiology of schizophrenia in childhood, 229
,, Dreams in sand, 235
Electrical activity of the human brain during artificial sleep. Wyke, B. D. (E.), 211
,, ,, of the Nervous System, The, by M. A. Brazier (R.), 343
,, stimulation of the brain, the effect of, on the perception of pain, by P. G. Croft, 421
Electrically induced convulsions in rabbits, effect of hypercapnia and hypoxia, on. Dahlberg-Parrow, R. (E.), 514
Electrocorticography in psychomotor epilepsy. Green, J. R., *et al.* (E.), 353
Electronarcosis, changes in the white cells and sugar of the blood as a result of. Geiser, M. (E.), 573
Electro-shock, changes of the copper content of blood after. Ferroni, A. (E.), 372
,, effects of repeated convulsions from, on some blood enzymes. Tripodo, C. (E.), 227
,, seizures, anticonvulsant activity of 2.2-disubstituted 1.3 propandediols in. Berger, F. M. (E.), 757
,, therapy, mechanism of. Spiegel-Adolf, M., *et al.* (E.), 513
Emotion and 2-tetrahydronaphthylamine, the effect of, on the adrenal cortex of the rat. Vogt, M. (E.), 757
Emotions and Clinical Medicine, by S. Cobb (R.), 189
Emotional disorders, proteolytic enzyme systems in patients with. Jacobs, J. S. L., *et al.* (E.), 751
Engler, M., A comparative study of the causation of mongolism, peristatic amentia and other types of mental defect, 316
Enzymes of gray matter and white matter of dog brain. McNabb, A. R. (E.), 750
Epilepsy in children, psychiatric aspects of, by D. A. Pond, 404
,, cognitive factors in. Davies-Eysenck, M. (E.), 738
,, on the genetic prognosis of. Harvald, B. (E.), 492
,, mode of action of dilantin in. Aird, R. B., and Strait, L. (E.), 758
,, in the monkey, chronic, following multiple intracerebral injections of alumina cream. Chusid, J. G., *et al.* (E.), 513
,, treatment of adults for. Bailey, A. A., and Worden, R. E. (E.), 369, 370
,, see under E.C.T. action
Ergotamine, anticonvulsant action of. Reichert, W. (E.), 513
Estrogen, the effect of, on the phosphate turnover in the hypophyseal-diencephalic system. Borell, U., and Westman, A. (E.), 220
"Etamon," the use of, for high blood-pressure in electrocerebral treatment, by G. Davies and A. S. Paterson, 306
Ethyl alcohol, the inhalation of, by man. Lester, D., and Greenberg, L. A. (E.), 215
Extrapyramidal action, pharmacological aspects of drugs of: II. Holz, S. (E.), 512

Fang, T. C., A note on the A-Bridge count and intelligence, 185.
Fatigue and pain tolerance in depressive and psychoneurotic patients, by K. R. L. Hall *et al.*, 433
Fischer, S., Principles of General Psychopathology (R.), 343
Fitzgerald, O. W. S., Personality and Psychosis (R.), 491
Fitzherbert, Joan, Some further observations on head-banging and allied behaviour, 330
Fleischhacker, H. H., and Bullock, F. N., Studies in schizophrenia: II, 466
Foale, M., The treatment of mental defectives with glutamic acid, 483
Freeman, J., Hay-Fever (R.), 190
French, C. N., The Story of St. Luke's Hospital (R.), 490
Freudenberg, R. K., Observations on the relation between insulin coma dosage and prognosis in schizophrenia, 441
Frontal granular cortex, effects of subtotal lesions of, on delayed reaction in monkeys. Blum R. A. (E.), 724
,, lobe function, a theory of. Arnot, R. (E.), 725
,, lobes, a comparison of the psychological effects of different types of operations on the, by A. Petrie, 326
,, ,, and anguish. Landes, C. (E.), 736
,, topectomy, effects of, on autonomic nervous stability in schizophrenia. Glaser, G. H. (E.), 736

Galbraith, A. J., *et al.*, Clinical and E.E.G. aspects of psychiatric disorders associated with tetany, 618
Gargoylism, by R. C. MacGillivray, 687
Genetic Neurology, by P. Weiss. (R.), 187
Gibson, J. J., The Perception of the Visual World (R.), 717
Glucose tolerance in chronic schizophrenias and senile states. Simon, W., and Garvey, J. T., (E.), 198

Glutamate applied directly into the brain, etc., epileptogenic action of. Okamoto, S. (E.), 750
Glutamic acid content of brain in relation to thiopentone anesthesia, metabolism and. Dawson, R. M. C. (E.), 513
,, ,, decarboxylase in brain. Roberts, E., and Frankel, S. (E.), 222
,, ,, and intelligence quotient. Delay, J., and Pichot, P. (E.), 219
,, ,, significance of, for the metabclism of nervous tissue. Weil-Malherbe, H. (E.), 220
,, ,, the treatment of mental defectives with, by M. Foale, 483
Glutathione level, blood, in mental disease before and after treatment. Altschule, M. D., *et al.* (E.), 496
Glycolysis catalyzed by an extract of rat brain, effect of potassium and ammonium ions upon. Muntz, J. A., and Hurwitz, J. (E.), 368
,, of rabbit brain *in situ*, determination of anaerobic. Bredow, W., and Thorn, W. (E.), 225
,, of the warm-blooded brain *in situ*, anaerobic. Thorn, W. (E.), 224
Glycolytic scheme, the effect of ammonium ions upon isolated reactions of the. Muntz, J. A., and Hurwitz, J. (E.), 368
Goldman-Eisler, F., Individual differences between interviewers and their effect on interviewees' conversational behaviour, 660

Hall, K. R. L., Conceptual impairment in depressive and organic patients of the presenile age-group, 256
,, and Crookes, T. G., Learning impairment. II. Psychoneurotic patients, 273
,, *et al.*, A preliminary report on fatigue and pain tolerance in depressive and psychoneurotic patients, 433
Hallucinations in schizophrenia, effects of factors that modify cerebral blood-flow on. Altschule, M. D. (E.), 731
Hardman, J., and Thorpe, F. T., The lower quadrant leucotomy, 389
Hare, E. H., The ecology of mental disease, 579
Harrison, E. J., and Robin, A. A., Some clinical and aetiological aspects of depersonalization, 469
Hay-Fever, by J. Freeman (R.), 190
Head-banging and allied behaviour, some further observations on, by Joan FitzHerbert, 330
Hemicrania. Morris, G. (E.), 366
Hepatolenticular degeneration. Hood, B., and Fagerberg, S. E. (E.), 751
Hetherington, R., The effects of E.C.T. on the drawings of depressed patients, 450
,, Psychological changes due to E.C.T., as measured by a battery of tests given repeatedly, 334
Hexamethonium, the effect of, etc. Schnaper, H. W., *et al.* (E.), 371
Hill, D., and Pond, D. A., Reflections on one hundred capital cases submitted to E.E.G., 23
Hindlimb reflexes in chronic spinal dogs, comparative actions of analgesic, hypnotic and paralytic agents on. Houde, R. W., *et al.* (E.), 513
Homeostatic studies in patients with so-called psychosomatic disease. Rupp, C., *et al.* (E.), 502
Hordern, A., The response of the neurotic personality to abreaction, 630
Houston, F., A preliminary investigation into abreaction, comparing methedrine and sodium amytal with other methods, 707
p-hydroxypropiophenone in psychiatry. Haour, P., and Miribel, J. (E.), 755

Insulin coma dosage aad prognosis in schizophrenia, observations on the relation between, by R. K. Freudenberg, 441
,, ,, and electroshock, action of potassium in. Cicardo, V. H., and Fontana, A. E. (E.), 372
,, therapy, analysis of prognostic factors in. Cohen, M. (E.), 350
,, ,, of the psychoses, fatalities in. Scheflen, A. E., *et al.* (E.), 496
,, see under EEG
Interviewers and their effect on interviewees' conversational behaviour, individual difference between, by F. Goldman-Eisler, 660
Intoxication tests for drinking drivers and pedestrians. Hunter, O. B., jun. (E.), 513
Intracranial tumors, clinical and experimental studies with fluorescein dyes, etc. Moore, G. E., *et al.* (E.), 367

Jong, R. N. de, The Neurologic Examination (R.), 189

Kaldegg, A., Migraine patients, 672
Kay, W. W., and Rowntree, D. W., Clinical, biochemical and physiological studies in cases of recurrent schizophrenia, 100
Keehn, J. D., Rorschach validation, 697
Kelly, J., and Pinkerton, P., An attempted correlation between clinical and psychometric findings in senile-arterio-sclerotic dementia, 244

Khellin, central nervous depressive action of. Chen, G., *et al.* (E.), 757
Klein, R., Immediate effects of leucotomy on cerebral functions and their significance, 60

Latah reaction, the, by P. M. Yap, 515
Law Relating to Mental Treatment and the Health Service, The, by H. Berry (R.), 191
Leão's spreading depression, on the conditions for the recording of. van Harreveld, A., and Stamm, J. S. (E.), 353
Learning impairment. II. Psychoneurotic patients, by K. R. L. Hall and T. G. Crookes, 273
Le Beau, J., Post-operative syndromes in selective prefrontal surgery, 12
Leigh, D., pellagra and the nutritional neuropathies, 130
Leucotomy and its effects, the patient's attitudes to, by E. Stengel, 382
,, immediate effects of, on cerebral functions and their significance, by R. Klein, 60
,, the lower quadrant, by F. T. Thorpe and J. Hardman, 389
Lhermitte, J., Brain and Thought (R.), 718
"LH-Release apparatus" of female rats, a 24-hour periodicity in the, disclosed by barbiturate sedation. Everett, J. W., and Sawyer, C. H. (E.), 225
Lobotomized and control patients, a progress study of. Friedman, S., *et al.* (E.), 195
Lobotomy results, a correlation of, with basic reaction types. Johnson, O., and Ehrenberg, R. (E.), 722
,, unilateral and bilateral. Simon, A., *et al.* (E.), 350
Lorand, S., Clinical Studies in Psychoanalysis (R.), 490
LSD, mental changes experimentally produced by. De Shou, H. J., *et al.* (E.), 743
Lyketsos, G., and Chamberlain, H. A., relationship between insulin coma threshold of schizophrenic patients and their resting E.E.Gs., 122

MacGillivray, R. C., Gargoylism, 687
MacLeod, L. D., and Carpenter, R. K., The effects of ethyl alcohol and acetaldehyde on maze behaviour and motor co-ordination in rats, 167
Maladjusted children, eye manifestations in, by E. Wellisch, 457
Malononitrile, action of, in rabbit brain. Reale, G., and D'Argenio, L. (E.), 750
"Malononitrile" administration, cytology of rabbit neurones after. Liu, C-N. (E.), 350
Manic-depressive psychosis, inheritance of. Merrell, D. J. (E.), 348
Marriage and the Jewish Tradition. S. R. Brav (R.), 489
Maternal Care and Mental Health, by J. Bowlby (R.), 491
Mayer-Gross, W., The diagnostic significance of certain tests of carbohydrate metabolism in psychiatric patients and the question of "oneirophrenia," 683
Maze behaviour and motor co-ordination in rats, the effects of ethyl alcohol and acetaldehyde on, by R. K. Carpenter and L. D. MacLeod, 167
McAdam, W., and McClatchey, W. T., The E.E.G. in aged patients in a mental hospital, 711
McClatchey, W. T., and McAdam, W., The E.E.G. in aged patients in a mental hospital, 711
McCowan, P. K., The Presidential Address: Whither Psychiatry?, 1
McFie, J., and Piercey, M. F., The relation of laterality of lesion to performance on Wiegl's sorting test, 295
McIlwain, H., *et al.*, Metabolic response to electrical stimulation in separated portions of human cerebral tissues, 265
Mental disease, changes in nervous tissues and study of living organisms in. Papez, J. W., and Bateman, J. F. (E.), 502
,, ,, the ecology of, by E. H. Hare, 579
,, Diseases, New Outlook on, F. A. Pickworth (R.), 344
Mentally deficient children, exploration of metabolic patterns in. Cain, L. (E.), 753
,, see under Foale, M
Mescaline and lysergic acid, effects of. Hoch, P. H., *et al.* (E.), 494
Metabolic response to electrical stimulation in separated portions of human cerebral tissues, by H. McIlwain *et al.*, 265
Metabolism of rat brain and liver *in vitro*, effect of sodium salicylate and acetylsalicylate on. Fishgold, J. T., *et al.* (E.), 228
Methonium compounds, excretion of the. Milne, G. E., and Oleesky, S. (E.), 370
Micklem, L. P., and Shattock, F. M., An investigation of the adrenocortical response of mental patients to E.C.T. and insulin hypoglycemia, 287
Migraine, dynamic concepts of. Furmanski, A. R. (E.), 496
,, patients, by A. Kaldegg, 672
,, treatment of. Bercel, N. A. (E.), 371
,, treatment of persons suffering from, by histamine and antihistamine substances. Biro, L. (E.), 759
Mikesell, W. H., Modern Abnormal Psychology (R.), 191
Millar, W. M., and Valentine, M., Teaching aids in clinical psychiatry, 477
Mongolism, peristatic amentia and other types of mental defect, a comparative study of the causation of, by M. Engler, 316

Morrissey, J. D., and Roth, M., Problems in the diagnosis and classification of mental disorder in old age, 66
Motor cortex of macaque, ipsilateral facial representation in. Lauer, E. W. (E.), 739
Multiple sclerosis. Swank, R. L. (E.), 223

Narcolepsy, by D. A. Pond, 595
Narcotics and convulsants, effects of, on tissue glycolysis and respiration. Webb, L. J., and Elliott, K. A. C. (E.), 758
Narcotics and sympathomimetic amines, antagonism and synergism between, in their action on the C.N.S. of vertebrates. Ya, S. (E.), 226
Naumburg, M., Schizophrenic Art (R.), 342
Nembutal, the effect of, on the *in vivo* rate of oxygen consumption of the cerebral cortex. Grenell, R. G., and Davies, P. W. (E.), 756
Nerve, a hexokinase inhibitor in. Abood, L. G., and Gerard, R. W. (E.), 369
,, biochemical action of. Okinaka, S., *et al.* (E.), 747
,, ,, studies on the action of the. Okinaka, S., *et al.* (E.), 222
,, electrical phenomena in: III. Shanes, A. M. (E.), 752
,, function, studies in permeability in relation to: III. Korey, S. R., and Mitchell, R. (E.), 750
,, Impulses, the Transmission of, at Neuroeffector Junctions and Peripheral Synapses, by A. Rosenblueth (R.), 187
Nervous activity, the physical chemical basis for the action of calcium during. Monnier, A. M. (E.), 369
,, centres, the glucides of. Baudouin, A. (E.), 368
,, impulse, conduction of the. Hodgkin, A. L. (E.), 512
,, system, connection between the state of, and variations of the chloride content in the blood. Kosyakov, K. S. (E.), 754
,, ,, effect of nutrition on the distribution of vitamin B_1 in parts of the. Zaprudskaya, D. S. (E.), 511
,, ,, microchemical studies of: VIII. May, R. T., and Thillard, M. J. (E.), 221
Neurocirculatory asthenia, life situations, emotions and. Cohen, M. E., and White, P. D. (E.), 507
Neurologic Examination, by R. N. de Jong (R.), 189
Neuropathology of antibiotic-induced peripheral nerve paralysis. Woodhall, B., *et al.* (E.), 223

Old age, problems in the diagnosis and classification of mental disorder in, by M. Roth and J. D. Morrissey, 66
Oligophrenia, the effect of sex hormones in, by G. de M. Rudolf, 294
Oneirophrenia, see under carbohydrate metabolism
Osmond, H., and Smythies, J., Schizophrenia, a new approach, 309
Oximetry, see under spectroscopic
Oxygen consumption of brain slices, effects of pentobarbital, amobarbital and barbital on the. Westfall, B. A. (E.), 225

Pain, see under electrical stimulation of the brain and fatigue and pain tolerance.
Pain perception, the assessment of, by P. G. Croft, 427
Paintings of psychotics, the use of colour in the, by J. P. S. Robertson, 174
Parental deprivation and the "broken home" in dementia praecox and other mental disorders. Oltman, J. E., *et al.* (E.), 721
Paterson, A. S., and Davies, G., The use of "Etamon" for high blood-pressure in electro-cerebral treatment, 306
Pellagra and the nutritional neuropathies, by D. Leigh, 130
,, corn causes. Rudolph, W. (E.), 367
Pellagrous neuropathy, a case of. Hutton, P. W. (E.), 755
Penfield, W., and Rasmussen, T., The Cerebral Cortex of Man (R.), 188
Pentobarbital, delayed arrest of rat brain slice respiration caused by, during the metabolism of glucose. Karlsson, J. L., *et al.* (E.), 758
Perceptual anomaly, experimental studies of a: II, by M. R. Shapiro, 605
Personality and the Frontal Lobes, by A. Petrie (R.), 716
,, and Psychosis, by O. W. S. Fitzgerald (R.), 491
Petit mal epilepsy, use of methyl phenylsuccinimide in treatment of. Zimmermann, F. T. (E.), 200
Petrie, Asenath, Personality and the Frontal Lobes (R.), 716
,, A comparison of the psychological effects of different types of operations on the frontal lobes, 326
Phenamine, effect of, on the activity of the higher regions of the C.N.S. of animals. Faddeeva, V. K. (E.), 756
Phenylketonuria, an atypical case of. Cowie, V. A. (E.), 369
Philosophy, a History of, by F. Thilly (R.), 717
Phosphatase reactions in nerve tissues, morphology of. Tolone, S. (E.), 749
Phosphate transport and turnover in the brain. Sacks, J., *et al.* (E.), 222

Phosphates in sections of mammalian brain *in vitro*, actions of electrical stimulation and of 2, 4, dinitrophenol on the. McIlwain, H., and Gore, M. B. R. (E.), 749

PICKWORTH, F. A., New Outlook on Mental Diseases (R.), 344

PIERCY, M .F., and MCFIE, J., The relation of laterality of lesion to performance on Weigl's sorting test, 299

PINKERTON, P., and KELLY, J., An attempted correlation between clinical and psychometric findings in senile-arterio-sclerotic dementia, 244

Pituitary-adrenocortical system, non-convulsive electrostimulation and the. Taylor, R. H., *et al.* (E.), 502

POLLAK, O., *et al.*, Social Science and Psychotherapy for Children. (R.), 490

POND, D. A., Narcolepsy, 595

,, Psychiatric aspects of epilepsy in children, 404

,, and HILL, D., Reflections on one hundred capital cases submitted to E.E.G., 23

Post-alcoholic psychomotor agitation, a new adjuvant in. Kissen, M. D., *et al.* (E.), 508

Prefrontal leukotomy. Klotz, M., *et al.* (E.), 743

,, lobotomy, changes in the body-weight of schizophrenic patients following. Buck, C. W., *et al.* (E.), 195

,, ,, and topectomy in chronic psychoses, clinical and E.E.G. effects of. Krueger, E. G., and Wayne, H. L. (E.), 726

,, region efferent connections of the human, with reference to fronto-hypothalamic pathways. Meyer, A., *et al.* (E.), 360

,, surgery, post-operative syndromes in selective, by J. Le Beau, 12

Presenile age-group, conceptual impairment in depressive and organic patients of the, by K. R. L. Hall, 256

Prestriate cortex, effect of ablation of, on auditory-visual association in monkey. Evarts, E. V. (E.), 740

Proteolipides, their isolation from brain. Folch-Pi, J., and Lees, M. (E.), 754

Prothrombin in nervous patients : II. Ferraris, M. (E.), 749

Psychoanalyse de l'Artiste et son Oeuvre, by N. N. Dracoulides (R.), 716

Psychoanalysis, clinical studies in, by S. Lorand (R.), 490

Psychiatric patients, vocational rehabilitation of, by T. A. C. Rennie *et al.* (R.), 489

" Psychiatry Ltd.," by Desmond Curran, 373

Psychiatry, More About, by C. Binger (R.), 344

,, Textbook of, by E. Bleuler (R.), 719

Psychopathology, Principles of General S. Fischer (R.), 343

Psychotic Art. F. Reitman (R.), 342

,, and psychoneurotic patients, non-epinephrine and epinephrine-like substances in. Funkenstein, D. H., *et al.* (E.), 721

Psychology, Annual Review of, ed. by C. P. Stone (R.), 188

,, ,, ,, Vol. III, ed. by C. P. Stone (R.), 716

,, Modern Abnormal, by W. H. Mikesell (R.), 191

Psychoses, the color of the filtrate of the diluted and boiled blood in : I. Yano, M. (E.), 753

Psychosurgery patients, psychological observations on. Landis, C. (E.), 363

Psychotic behaviour, some biochemical considerations of. Hoagland, H. (E.), 731

Pyrimidine derivatives, central stimulating and depressing effects of certain. Jacob, J. (E.), 759

Radioactive phosphorus in normal and diseased brain tissue, the distribution of. Stern W. E., and Marshall, C. (E.), 753

,, ,, in normal brain and brain tumors, the uptake of. Stapleton, J. E., *et al.* (E.), 750

,, potassium, a new isotope for brain-tumour localization. Selverstone, B., *et al.* (E.), 752

RASMUSSEN, T., and PENFIELD, W., The Cerebral Cortex of Man (R.), 188

Recoil reflex, effect of vegetative nervous system on. Gumenyuk, I. G. (E.), 220

REES, W. LINFORD and KING, G. M., Cortisone in the treatment of schizophrenia, 401

REITMAN, F., Psychotic Art (R.), 342

RENNIE, T. A. C., *et al.*, Vocational Rehabilitation of Psychiatric Patients (R.), 489

ROBERTSON, J. P. S., the use of colour in the paintings of psychotics, 174

ROBIN, A. A., and HARRISON, E. J., some clinical and aetiological aspects of depersonalisation, etc., 469

Rorschach validation, by J. D. Keehn, 697

ROSENBLUETH, R., The Transmission of Nerve Impulses at Neuroeffector Junctions and Peripheral Synapses (R.), 187

ROTH, M., A theory of E.C.T. action and its bearing on the biological significance of epilepsy, 44

,, and MORRISSEY, J. D., Problems in the diagnosis and classification of mental disorder in old age, 66

ROWNTREE, D. W., and KAY, W. W., Clinical, biochemical and physiological studies in cases of recurrent schizophrenia, 100

RUF, H., Experiments on the prolongation of induced epileptiform convulsions in the cat, 454
RUSSELL, J. G., and CHAMBERLAIN, G. H. A., The E.E.Gs. of the relatives of schizophrenias, 654

Salmon, Thomas W., Psychiatrist, by E. D. Bond (R.), 192
Schizophrenia see under cortisone
Schizophrenia in childhood, the aetiology of, by L. F. W. Eickhoff, 229
,, and hormones. Malamud, W. (E.), 753
,, a new approach, by H. Osmond and J. Smythies, 309
,, pyruvic acid in. Dalla Torre, L., *et al.* (E.), 749
,, recurrent, clinical, biochemical and physiological studies in cases of, by D. W. Rowntree and W. W. Kay, 100
,, results of treatment of, in a state hospital. Currier, G. E., *et al.* (E.), 496
,, studies in: II, by H. H. Fleischhacker and F. N. Bullock, 466
,, turn-over of the ether-soluble plasma phosphatides in. Perntz, A. (E.), 492
,, -like symptoms, experimental. Rinkel, M., *et al.* (E.), 494
Schizophrenias of childhood. Sackler, A. M., *et al.* (E.), 731
Schizophrenic Art, by M. Naumburg (R.), 342
,, and control groups, metabolic patterns of. Young, M. K., *et al.* (E.), 753
Schizophrenics, the E.E.Gs. of the relatives of, by G. H. A. Chamberlain and J. G. Russell, 654
SCHNEIDER, R. A., and DOUST, J. W. LOVETT, studies on the physiology of awareness, 411, 640
Senile-arterio-sclerotic dementia, an attempted correlation between clinical and psychometric findings in, by P. Pinkerton and J. Kelly, 244
Sex steroid therapy in psychiatric disorders. Sackler, M. D., *et al.* (E.), 492
SHAPIRO, M. B., Experimental studies of a perceptual anomaly: II, 605
SHATTOCK, F. M., and MICKLEM, L. P., An investigation of the adrenocortical response of mental patients to E.C.T. and insulin hypoglycemia, 287
Shock therapy, changes in phosphatase activity of serum and urine after. Altschule, M. D., and Parkhurst, B. H. (E.), 496
SMITH, S., Sympathetic blockade in the treatment of anxiety states, 161
SMYTHIES, J., and OSMOND, H., Schizophrenia, a new approach, 309
Sober Truth, The, by L. Williams (R.), 190
SOMMERHOFF, G., Analytical Biology (R.), 488
Social Science and Psychotherapy for Children, by O. Pollak, *et al.* (R.), 490
Soviet Psychiatry, by J. Wortis (R.), 188
Spectroscopic and photo-electric oximetry in schizophrenia and other psychiatric states, by J. W. Lovett-Doust, 143
Spinal reflexes, actions of nicotine on. Nicolau, J. del C. (E.), 512
STENGEL, E., The patient's attitude to leucotomy and its effects, 382
St. Luke's Hospital, The Story of, by C. N. French (R.), 490
STOLZENBERG, J., Psychosomatics and Suggestion Therapy in Dentistry (R.), 344
STONE, C. P., The Annual Review of Psychology (R.), 188
,, Annual Review of Psychology, Vol. III (R.), 716
Striate cortex, sites of origin of electric potentials in. Bishop, G. H., and Clare, M. H. (E.), 740
Succinyl-choline-iodide as a muscular relaxant in E.C.T. Holmberg, G., and Thesleff, S. (E.), 722
Sympathetic nervous system and the adrenals, relation between the adaptation-tropic filaments of. Senkevich, I. V. (E.), 220

Teaching aids in clinical psychiatry, by W. M. Millar and M. Valentine, 477
Temporal arteritis, the psychiatric aspects of, by R. Vereker, 280
,, lobe epilepsy, ictal and non-ictal psychiatric disorders in. Gibbs, F. A. (E.), 209
Testes of schizophrenics, the question of histopathological changes in the, by J. H. Blair, *et al.*, 464
Tetanus intoxication and its effect on the metabolism of central nervous tissue. Asakura, S., *et al.* (E.), 222
Tetany, clinical and E.E.G. aspects of psychiatric disorders associated with, by D. S. G. M. Bailey *et al.*, 618
Thalamic activity in stupor. Williams, D., and Parsons-Smith, G. (E.), 351
,, projection in the cortex, diffuse. McLardy, T. (E.), 204
Thalamo-cingulate fasciculotomy. Siris, J. H. (E.), 214
Thalamus in psychoses, significance of the. Bateman, J. F., and Papez, J. W. (E.), 731
THILLY, F., A History of Philosophy (R.), 717
THORPE, F. T., and HARDMAN, J., The lower quadrant leucotomy, 389
Tolserol in the treatment of the post-alcoholic state. Herman, M., and Effron, A. S. (E.), 215

Trace elements in the brain, microchemical studies on the topical distribution of. Bertha, H., *et al.* (E.), 221
Transorbital lobotomy, lesions of. Freeman, W., and Williams, J. M. (E.), 200
Tryptophan, the metabolism of in certain nervous diseases. Verga, G. (E.), 753

Valentine, M., and Millar, W. M., Teaching aids in clinical psychiatry, 477
Vereker, R., The psychiatric aspects of temporal arteritis, 280
Visual World, The, Perception of the, by J. J. Gibson (R.), 717
Vitamin B_{12}, the use of, in the management of the neurological manifestations of diabetes mellitus. Sancetta, S. M., *et al.* (E.), 756

Weigl's sorting test, the relation of laterality of lesion to performance on, by J. McFie and Piercy, M. F., 299
Weil-Malherbe, H., and Bone, A. D., The concentration of adrenaline-like substances in blood during insulin hypoglycaemia, 565
Weiss, P., Genetic Neurology (R.), 187
Wellisch, E., Eye manifestations in maladjusted children, 457
Whither Psychiatry ?, the Presidential Address, by P. K. McCowan, 1
Williams, L., The Sober Truth (R.), 190
Wisdom, Madness and Folly, by J. Custance (R.), 343
Wortis, J., Soviet Psychiatry (R.), 188

Yap, P. M., The Latah reaction, 515

PART II.—AUTHORS REFERRED TO IN THE EPITOME.

Abood, L. G., 369
Adey, W. R., 201
Agostini, L., 219
Aird, R. B., 758
Alexander, L., 739
Alman, R. W., 751
Altschule, M. D., 496, 496, 731
Ambard, L., 219
Arbuzov, S. Y., 756
Ardy, C., 368
Arnot, R., 725
Asakura, S., 222
Aust, J. B., 367

Babskii, E. B., 224
Bailey, A. A., 369, 370
Bain, J. A., 225
Bakay, L., 350
Baker, B. L., 220
Barbato, L., 218, 218
Bateman, J. F., 502, 731
Baudouin, A., 368
Bedford, T. H. B., 219
Belcher, E. H., 223
Belfrage, G., 749
Bennett, A. E., 731
Bercel, N. A., 371
Berger, F. M., 757
Bernardis, L., 747
Bertha, H., 221
Bertrán, E. C., 368
Betwinick, J., 215
Bickerstaff, E. R., 367
Biro, L., 759
Bishop, G. H., 740
Bloom, W. L., 366
Blum, R. A., 724
Boda, D., 511
van Bork, J. J., 371
Borell, U., 220
Bornmann, G., 757
Bouzarth, W. F., 722
Boyd, E. M., 371
Braceland, F. J., 721
Bravi, G., 221
Bredow, W., 225
Bremier, R., 513
Broadbent, T. R., 223
Brody, M., 743
Brody, S., 745
Brody, T. M., 225
Broman, T., 221
Brower, D., 359
Bruce, H. M., 755
Brug, J., 514
Buck, C. W., 195
Burns, B. D., 748

Cafiero, M., 369
Cain, L., 753
Candill, C. M., 367
Carlisle, E. M., 227
Carter, S., 756
Castor, C. W., 220
Chabrier, P., 226
Chance, M. R. A., 227
Chen, G., 348, 757, 758
Chennells, M., 757
Cheymol, J., 226, 227
Choremis, C., 511
Choa, S. N., 367
Chusid, J. G., 513
Cicardo, V. H., 223, 372, 513
Clare, M. H., 740
Clark, S. L., 740
Cobb, S., 724
Cohen, M., 350
Cohen, M. E., 507
Cohn, J. B., 353
Covian, F. G., 222
Cowie, V. A., 369
Crescitelli, F., 221, 227
Culbreth, G. G., 222
Currier, G. E., 496

Dahlberg-Parrow, R., 514
Dahlgren, K. G., 492
Dalderup, L. M., 371
Damast, B., 222
D'Argenio, L., 750
Davies, P. W., 756
Davies-Eysenck, M., 738
Dawson, R. M. C., 513
Delay, J., 219
Della Torre, L., 749
De Show, H. J., 743
Dessi, P., 367
Dixon, K. C. 512
Donovan, A. M., 219

Effron, A. S., 215
Ehrenberg, R., 722
Eldjarn, L., 226, 226
Eldred, E., 739
Elithorn, A., 366
Elliott, K. A. C., 219, 747, 748, 758
Etling, N., 748
Evans, H. D., 223
Evarts, 740
Everett, J. W., 225

Faddeeva, V. K., 756
Fagerberg, S. E., 751
Fazekas, J. F., 751
Feldberg, W., 367, 510
Ferenz, P., 511
Ferraris, M., 749
Ferroni, A., 372
Field, J., 228
Fishgold, J. T., 228
Folch-Pi, J., 754, 754, 754
Foley, J. M., 219
Fontana, A. E., 372
Frankel, S., 222
Freeman, W., 200
Friedman, S., 195
Fries, E. D., 371
Funcke, A. B. H., 514
Funkenstein, D. H., 721
Furmanski, A. R., 496

Gaerskaya, M. S., 754
Gallinek, A., 737
Garvey, J. T., 198
Geiser, M., 513
Gerard, R. W., 369
Giordano, G. G., 748
Glaser, G. H., 736, 752
Goldbaum, L. R., 372
Good, M. L., 366
Gore, M. B. R., 749, 751
Goto, J., 222
Gottesfeld, B. H., 215
Gottlieb, J. S., 348
Greenberg, L. A., 215
Green, J. R., 353
Grenell, R. G., 756
Gumenyuk, I. G., 220

Hall, V. E., 228
Handler, P., 366
Haour, P., 755
van Harreveld, A., 353
Harris, G. W., 367
Harvald, B., 492
Harvey, J., 353
Hazard, R., 226
Henderson, N., 219
Henry, C. E., 728
Herbertson, B. M., 512
Herman, M., 215
Heyman, A., 369
Higashiyama, A., 222
Himwich, H. E., 502, 722
Hiraoka, K., 228
Hirschel, M. I., 371
Hoad, B., 751
Hoagland, H., 731
Hoch, P. H., 494, 494
Hochwald, H. L., 508
Hodgkin, A. L., 512
Holmberg, G., 722
Holz, S., 512
Houde, R. W., 513
Hubbard, T. F., 372
Hullin, R. P., 225
Humphrey, M. E., 360
Hunter, O. B., jun., 513
Hurwitz, J., 368, 368
Hutton, P. W., 755

Ibbott, F. A., 366
Igersheimer, W. W., 198
Ingle, D. J., 220
Itô, S., 367
Iwai, S., 367

Jacobs, J., 759
Jacobs, J. S. L., 751
Javer J., 223
Johnson, O., 722
Johnson, R. L., 371
Jones, R. O., 756
Jones, R. W., 369

Kakushkina, E., 748
Karlsson, J. L., 758
Kemali, D., 748
Kennedy, G. C., 755
Kety, S. S., 224
Kinashi, A., 222
Kingswill, C. J., 371
Kirstein, L., 728
Kissen, M. D., 508
Klotz, M., 743
Knapp, P. H., 737
Kodama, T., 511
Koenigstein, H., 510
Korey, S. R., 750
Kosyakov, K. S., 754
Krehl, W. A., 751
Krueger, E. G., 726

Labo, G., 367
Landis, C., 363, 736
Lauer, E. W., 739
Leão, A. A. P., 353
Lees, M., 754
Lennox, M. A., 204
Lenti, C., 369
Lester, D., 215
Lewis, G. T., 366
Li, C. H., 220
Lickint, F., 510, 510
Lin, R. C. Y., 367
Lipsett, M. N., 221
Lissák, K., 511, 512
Liu, C-N., 350

Machover, S., 215
Maier, H., 371
Malamud, W., 753
Maleci, A., 366
Malissa, H., 221
Malkiman, I. I., 224
Marshall, C., 753
Martensen, I., 748
Martensen-Larsen, O., 215
Martin, C., 512
Marvin, J. F., 367
Mastin, D. W., 755
May, R. M., 221
McCall, M. L., 512
McGhee, E. C., 366
McIlwain, H., 512, 749, 749,
  751, 752, 755
McLardy, T., 204
McLennan, H., 748
McNabb, A. R., 750
Meath, J. A., 754
Mercier, J., 371
Merrell, D. J, 348
Meyer, A., 360
Milne, G. E., 370
Miribel, J., 755
Meyers, R., 198
Milch, L. J., 510
Mitchell, R., 750
Moloney, W. C., 219
Monnier, A. M., 369
Montini, T., 368
Moore, G. E., 367
Morris, G., 366
Moussatché, H., 227
Müller, R., 492
Mundy-Castle, A. C., 499
Muntz, J. A., 368, 368

Nadler, C. S., 224
Naidoo, D., 360
Nichols, F. T., jun., 369
Nicolau, J. del C., 512
Nielsen, J. M., 203
Okamoto, S., 750
Okinaka, S., 222, 747
Oleesky, S., 370
Oltman, J. E., 721
Oppenheim, S., 359
Optiz, E., 369
Ord, M. G., 510
Owyang, E., 370

Page, I. H., 370
Palmer, D. M., 210
Papageorge, E., 366
Papez, J. W., 502, 731
Papo, I., 371
Parkhurst, B. H., 496
Parsons-Smith, G., 351
Pasamanick, B., 198
Patetta, M. A., 223
Patlers, J. W., 755
Paton, W. D. M., 748
Patterson, J. L., 369
Penfield, W., 348
Perntz, A., 492
Peters, J. P., 511
Petkevich, L., 748
Pichot, P., 219
Pine, I., 353
Pohl, F., 221
Polis, B. D., 224
Pratt, O. E., 360
Pratt, R. T. C., 201, 360
Prome, H. P., 721

Rasmussen, T., 353
Reale, G., 750
Redfearn, J. W. T., 366
Ricciuti, E. A., 355
Richter, D., 225
Riechert, W., 513
Rinkel, M., 494
Ritchie, J. A., 360
Roberts, E., 222
Robinson, F., 204
Rosenberg, A. J., 748
Rothlin, E., 370
Rudolph, W., 367
Rupp, C., 502

Sackler, A. M., 731
Sackler, M. D., 492
Sacks, J., 222
Salama, S., 758
Sancetta, S. M., 756
Sánchez, F. S., 368
Sasaki, H., 228
Sawyer, C. H., 225
Scheflen, A. E., 496
Scheinberg, P., 753
Schlesenger, E. B., 752
Schmidt, C. F., 224, 754
Schnaper, H. W., 371
Schneider, M., 369
Scoville, W. B., 728
Selberstone, B., 752, 755
Senkevich, I. V., 220
Serel, M., 728
Shaves, A. M., 752
Sherwood, S. L., 498
Shy, G. M., 752
Simon, A., 350
Simon, W., 198

Siris, J. H., 214
Small, R. G., 751
Smarzewska, K., 226
Smith, G. A., 367
Smith, J., 737
Snider, R. S., 739
Spiegel-Adolf, M., 513
Stamm, J. S., 353
Stapleton, J. E., 750
Stern, W. E., 753
Stevenson, J. A. F., 198
Stoppani, A. O. M., 223
Strait, L., 758
Sweet, W. H., 753
Susen, A. F., 752
Swank, R. L., 223

Taeschler, M., 370
Takaki, M., 222
Taylor, H. W., 512
Taylor, R. D., 370
Taylor, R. H., 502
Terrana, V., 218
Thesleff, S., 722
Thillard, M. J., 221
Thompson, R. H. S., 510
Thorn, W., 224
Thuillier, J., 227
Thunberg, T., 748
Till, K., 366
Töbel, F., 371
Toiver, D. B., 747
Tolone, S., 749
Trautman, S., 219
Trethowan, W. H., 724
Tripodo, C., 227
Tuohy, E. B., 371

Umřath, K., 747
Uzbekov, G. A., 224

Verga, G., 753
Vogt, M., 757
Voĭtkevich, A. A., 750
Volkova, I. N., 747

Ward, J. W., 740
Wayne, H. L., 726
Webb, L. J., 758
Weil, A. A., 729
Weil-Malherbe, H., 220
Welch, K., 348
Westfall, B. A., 370
Westmann, A., 220
White, P. D., 507
Wikler, A., 494, 755
Williams, D., 351
Williams, J. M., 200
Worden, R. E., 369
Wrenn, F. R., jun., 366
Wright, S., 758
Woodhall, B., 223
Westfall, B. A., 225
Wyke, B. D., 211

Ya, S., 226
Yano, M., 749, 753
Yoshii, N., 228
Yoshikawa, M., 222
Young, M. K., 753

Zańgwill, O. L., 360
Zaprudskaya, D. S., 511
Zeval'd, L. O., 750
Zimmermann, F. T., 200
Zubiani, A., 371

Made and printed in Great Britain by
Adlard & Son, Ltd.,
at their works, Bartholomew Press, Dorking.

UNIVERSITY OF LONDON LIBRARY
DO NOT REMOVE

VOL. XCVIII, NO. 410 JANUARY, 1952

THE JOURNAL
OF
MENTAL SCIENCE

(THE BRITISH JOURNAL OF PSYCHIATRY)

LET WISDOM GUIDE

BY AUTHORITY OF
THE ROYAL MEDICO-PSYCHOLOGICAL ASSOCIATION

EDITOR-IN-CHIEF
G. W. T. H. FLEMING

CO-EDITORS
Alexander Walk and P. K. McCowan

AND WITH THE ASSISTANCE OF

E. D. Adrian
W. Ross Ashby
Sir F. C. Bartlett
Sir Hugh Cairns
W. E. le Gros Clark
S. M. Coleman
C. J. C. Earl
Sir A. Fleming
F. L. Golla
C. J. McCarthy
Alfred Meyer
Lionel S. Penrose
A. A. W. Petrie
Derek Richter
E. T. O. Slater

LONDON
J. & A. CHURCHILL, LTD

Published Four times Yearly Twelve Shillings and Sixpence net

THE JOURNAL OF MENTAL SCIENCE

Communications on general editorial matters, including MSS. for publication, books for review and other printed matter, and communications regarding the *Epitome* section, including journals to be abstracted, should be sent to the **Editor-in-Chief, Barnwood House, Gloucester.**

Communications and inquiries regarding sales should be addressed to the Publishers, **Messrs. J. & A. CHURCHILL, Ltd., 104, Gloucester Place, Portman Square, London, W.1**; and those regarding Advertisements to the **Editor-in-Chief, Barnwood House, Gloucester.** Phone: Gloucester 66292.

THE ROYAL MEDICO-PSYCHOLOGICAL ASSOCIATION.

PUBLICATIONS.

From Messrs. Adlard & Son, Ltd.,
Bartholomew Press, Dorking, Surrey.

Enquiry (History) Form, for use in Mental Hospitals. In three sizes. Prices and specimen forms on application.

From Messrs. J. & A. Churchill, Ltd.,
104 Gloucester Place, W. 1

"The Journal of Mental Science." Published four times a year. Price 12/6. Postage extra.

From Messrs. Baillière, Tindall & Cox,
8 Henrietta Street, W.C. 2

"Handbook for Mental Nurses." 8th edn. In preparation.

"Manual for Mental Deficiency Nurses." 1931. Price 6/6 net.

"Occupational Therapy." Addendum to "Handbook." 1938. Price 6d.

From the Registrar, Southfield, Shipton Road, York.

"Regulations and Rules for the Nursing Examinations." Revised, 1938. Price 9d. each. Postage 1d.

"Examination Papers, 1928-38." Price 9d. each. Postage 1d.

"Regulations for the D.P.M. of the R.M.P.A."

From the Secretary, 11 Chandos Street, W. 1.

The Charter and By-Laws of the Association. Price 2/- Postage 1½d.

ADLARD & SON
LIMITED

BARTHOLOMEW PRESS
DORKING — SURREY

PRINTERS
OF THIS ::
:: JOURNAL

ESTIMATES SUBMITTED PROMPTLY

FOUNDED IN 1766, the Firm has continued uninterruptedly, and is able to undertake **ALL CLASSES OF PRINTING.**

The Staff is Specially Trained in the production of all printed matter connected with **Private Hospitals and Homes,** Medical, Scientific **and other Institutions.**

Regd. Offices: 194/200 BISHOPSGATE, E.C. 2.
Tel.: DORKING 3874.

THERATRONICS LTD.

invite your enquiries for an

Apparatus for
Counter-stimulus Therapy

An adjunct to Electroplexy (E.C.T.) and as a non-convulsive therapy, in accordance with Dr. Alexander's technique (modified).*

Central respiratory stimulus.

Reduces or eliminates post-convulsant memory-defect.

Relieves nervous tension.

A valuable aid in Electroplexy or as an independent psychiatric technique.

*See "Non-convulsive Electric Stimulation Therapy," by Leo Alexander, M.D., *Am. J. Psychiatry*, Vol. 107, No. 4, Oct. 1950.

THERATRONICS LTD. (Dept. B.7), 6 Argyle Walk, London, W.C. 1
Telephone: TERminus 2162/3

JOURNAL OF MENTAL SCIENCE

CONTENTS FOR JANUARY, 1952

PAGE

Original Articles—

The Presidential Address: Whither Psychiatry?; by *P. K. McCowan, M.D., F.R.C.P., D.P.M., J.P.* 1

Post-Operative Syndromes in Selective Prefrontal Surgery; by *J. Le Beau, M.D.* 12

Reflections on One Hundred Capital Cases Submitted to Electroencephalography; by *Denis Hill, M.B., F.R.C.P., and D.A. Pond, M.R.C.P., D.P.M.* 23

A Theory of E.C.T. Action and its Bearing on the Biological Significance of Epilepsy; by *Martin Roth, M.D.Lond., M.R.C.P., D.P.M.* . . 44

Immediate Effects of Leucotomy on Cerebral Functions and Their Significance: A Preliminary Report; by *R. Klein, M.D.* . . . 60

Problems in the Diagnosis and Classification of Mental Disorder in Old Age: With a Study of Case Material; by *Martin Roth, M.D.Lond., M.R.C.P., D.P.M., and J. D. Morrissey, M.B., D.P.M.* . . . 66

Adrenal Cortical Function and Response to Convulsive Therapy in a Case of Periodic Catatonia; by *W. Ross Ashby, M.A., M.D., D.P.M.* 81

Clinical, Biochemical and Physiological Studies in Cases of Recurrent Schizophrenia; by *Donald W. Rowntree, M.B., Ch.B.(NZ), D.P.M., and W. W. Kay, M.Sc., M.B., Ch.B.. F.R.I.C.* 100

Relationship Between Insulin Coma Threshold of Schizophrenic Patients and Their Resting E.E.Gs.; by *G. H. A. Chamberlain, M.D., M.R.C.P.I., D.P.M., and G. Lyketsos, M.D.* 122

Pellagra and the Nutritional Neuropathies: A Neuropathological Review; by *Denis Leigh, M.D., M.R.C.P.* 130

Spectroscopic and Photo-Electric Oximetry in Schizophrenia and Other Psychiatric States; by *John W. Lovett Doust, B.Sc., M.B., B.S., M.R.C.P.Lond.* 143

Sympathetic Blockade in the Treatment of Anxiety States; by *S. Smith, M.D.Leeds, M.R.C.P., D.P.M.* 161

The Effects of Ethyl Alcohol and Acetaldehyde on Maze Behaviour and Motor Co-ordination in Rats; by *R. K. Carpenter and L. D. MacLeod, B.Sc.Glas.* 167

The Use of Colour in the Paintings of Psychotics; by *J. P. S. Robertson, M.A., Ph.D.* 174

A Note on the *A–B* Ridge Count and Intelligence; by *T. C. Fang, Ph.D., B.Sc.* 185

Reviews 187

Genetic Neurology; edited by *P. Weiss*.—The Transmission of Nerve Impulses at Neuroeffector Junctions and Peripheral Synapses; by *A. Rosenblueth*.—Dementia Praecox or the Group of the Schizophrenias; by *Eugen Bleuler*.—Soviet Psychiatry; by *Joseph Wortis*.—The Annual Review of Psychology: Vol. II; edited by *C. P. Stone*.—The Cerebral Cortex of Man; by *W. Penfield and T. Rasmussen*.—The Neurologic Examination; by *R. N. De Jong, M.D.*—Emotions and Clinical Medicine; by *S. Cobb*.—The Sober Truth; by *Lincoln Williams*.—Hay-Fever; by *John Freeman, D.M. Oxon.*—Modern Abnormal Psychology; edited by *W. H. Mikesell*.—The Law Relating to Mental Treatment and the Health Service; by *Harold Berry*.—Thomas W. Salmon, Psychiatrist; by *Earl D. Bond, M.D.*

Bibliography and Epitome 193

1. Biochemistry, Pathology, etc.—2. Pharmacology and Treatment.

CONTENTS OF SUPPLEMENT

One Hundred and Tenth Annual Meeting.—First International Meeting of Neuropathologists.—Notices by the Hon. Librarian.—Notices by the Registrar.

UNIVERSITY OF LONDON
19 JAN
LIBRARY

Made and printed in Great Britain by Adlard & Son Ltd., Bartholomew Press, Dorking.

1456 1 1
1957
1975 1